CHAPTER 9
Integrated Test and Evaluation

9.0 Overview

9.0.1. Purpose

This chapter will help the program manager develop a robust, integrated T&E strategy to assess operational effectiveness and suitability and support program decisions.

9.0.2. Contents

Section 9.1 provides an introduction of general topics associated with T&E. Section 9.2 then presents an overview of the T&E support and oversight provided by the Offices of the Director, Operational Test and Evaluation (DOT&E); and the Under Secretary of Defense for Acquisition, Technology, and Logistics/Defense Systems/Systems Engineering (USD(AT&L)/DS/SE). The next few sections focus on specific types of T&E: Developmental Test and Evaluation, Operational Test and Evaluation, and Live Fire Test and Evaluation. Section 9.6 covers T&E planning and specifically addresses the T&E Strategy and the Test and Evaluation Master Plan. Section 9.7 covers T&E Reporting; section 9.8 presents best practices; and section 9.9 covers special topics. Section 9.10 closes with details of preparing a Test and Evaluation Master Plan.

9.1 Introduction to Test and Evaluation (T&E)

DoD Instruction 5000.2 requires that test and evaluation programs be structured to provide accurate, timely, and essential information to decision makers for programs in all acquisition categories throughout the system lifecycle. As the means to this goal, T&E is to identify and learn about deficiencies (technical or operational) so that they can be resolved prior to production and deployment. DT&E supports: the systems engineering process to include providing information about risk and risk mitigation; assessing the attainment of technical performance parameters; providing empirical data to validate models and simulations and information to support periodic technical performance and system maturity evaluations. Operational Assessments (OAs) are conducted early in a program to provide insight into potential operational problems and progress toward meeting desired operational effectiveness and suitability capabilities. OT&E is conducted to determine system operational effectiveness, suitability, and survivability. LFT&E permits the evaluation of system survivability in the context of vulnerability to realistic threat munitions and/or system lethality against realistic threat targets. This chapter provides DoD guidance to program managers for use in planning and executing an integrated T&E program within their programs.

The program manager should develop a robust, integrated T&E strategy for developmental test and evaluation (DT&E), operational test and evaluation (OT&E), and live fire test and evaluation (LFT&E) to validate system performance and ensure that the product provides measurable improvement to operational capabilities. However, the integrated approach should not compromise DT&E, OT&E, or LFT&E objectives. the program manager, in concert with the user and test communities, without compromising rigor, is required to integrate modeling and simulation (M&S) activities with government and contractor DT&E, OT&E, LFT&E, system-of-systems interoperability and performance testing into an efficient continuum. Testing shall be event driven within the program's overall acquisition strategy,

and allow for a realistic period of time in which to accomplish the planned T&E events, including report preparation. the program manager should develop a robust DT&E effort to ensure the goal of achieving a successful OT&E outcome. the program manager is required to develop metrics (hardware and software), in the form of T&E success criteria and OT&E entrance criteria in consultation with the OTA, to use in monitoring program maturity and to support decisions to progress through the development cycle. T&E Working-level Integrated Product Teams (T&E WIPT), may include representatives from Program Management Offices, T&E agencies, operational users, the OSD staff, DoD Component staffs, the intelligence community, and other agencies as necessary to assist in this task.

9.1.1. Evolutionary Acquisition

The T&E Strategy of a system acquired using evolutionary acquisition shall address each increment intended for fielding. In general, T&E that has previously confirmed the effectiveness and suitability of a previous increment need not be repeated in its entirety to confirm that the subsequent increment still provides those mission capabilities previously confirmed. However, regression testing to reconfirm previously tested operational capabilities and/or suitability might be required if the subsequent increment introduces a significantly changed hardware or software configuration, or introduces new functions, components, or interfaces that could reasonably be expected to alter previously confirmed capabilities.

9.1.2. Joint Capabilities Integration and Development System

Joint Capabilities Integration and Development System implementation is based on Joint Operating Concepts and Joint Integrating Concepts to define gaps, overlaps, and redundancies in joint mission capability, which in turn could result in a new materiel solution. We can expect to see effects of Joint Capabilities Integration and Development System on T&E, such as the need for more system-of-systems testing. T&E will need to assess whether systems deliver their intended capability within the applicable functional capabilities area. There will be a need to consider realistic test environments to represent the functional capabilities area, to assess an individual system's contribution to joint mission capability.

9.1.3.. Relationship of Joint Capabilities Integration and Development System Documents to T&E
9.1.3.1. Initial Capabilities Document (ICD)

The broad, time-phased, operational goals and requisite mission capabilities found in the Initial Capabilities Document drive the initial T&E Strategy development that becomes codified in the Test and Evaluation Strategy (TES). Because the Initial Capabilities Document statement of desired capabilities is broad, the TES may also be a broad, general discussion of the program's T&E Strategy. (See CJCSI 3170.01.)

9.1.3.2. Capability Development Document

The Capability Development Document builds on the Initial Capabilities Document by refining the integrated architecture and providing more detailed operational mission performance parameters necessary to design the proposed system. As the Capability Development Document is being developed to support Milestone B, and typically program initiation, the T&E WIPT concurrently transforms the TES, using the maturing Capability Development

Document as a basis, into a more comprehensive T&E Strategy that is documented in the Test and Evaluation Master Plan (TEMP). This process involves adding details (specific, desired, operational capabilities; T&E events (DT&E, OT&E, and LFT&E) adding to the broad, initial T&E Strategy; Critical Operational Issues; refining the management structure and composition of the T&E WIPT; identifying resource requirements more precisely; etc.) as they become available. Because the Capability Development Document normally is not approved until around the time of Milestone B, the T&E WIPT will most likely have to work from a draft version, since the initial TEMP is also due at Milestone B.

9.1.3.3. Capability Production Document (CPD)

The final step in the capabilities refinement process is the Capability Production Document development, with the Capability Production Document due at Milestone C. The refined, desired operational capabilities and expected system performance contained therein are used by the T&E WIPT to update the TEMP for the Milestone C decision and for subsequent updates later in Production and Deployment, such as the full rate production decision review. At Milestone C, the technical testing begins to focus on production testing, such as Production Qualification Testing, to demonstrate performance of the production system in accordance with the contract. Operational testing focuses on evaluating the system's operational effectiveness, suitability, and survivability.

9.1.4. Network-Centric Operations

Implementation of the Department's transformation strategy, calling for shifting to an information-age military, will result in fewer platform-centric and more network-centric military forces. This requires increased information sharing across networks.

The network-centric concept applies to a DoD enterprise-wide information management strategy that includes not only military force operations but also all defense business processes, such as personnel actions, fuel purchases and delivery, commodity buying, deployment activities, acquisition and development. Key tenets of the strategy include: handle information only once, post data before processing it, users access data when it is needed, collaborate to make sense of data, and diversify network paths to provide reliable and secure network capabilities.

The shift away from point-to-point system interfaces to network-centric interfaces brings implications for the T&E community. For example, previously, emphasis has been on testing interoperability between two or more platforms and their capability to exchange specifically required information. With network-centric operations, the emphasis will gradually shift to testing an integrated architecture for information processing necessary to achieve required force capabilities. The challenge to the test community will be to represent the integrated architecture in the intended operational environment for test. Furthermore, the shift to network-centric capabilities will evolve gradually, no doubt with legacy point-to-point interfaces included in the architectures. Program manager s, with their Program Executive Officer support, are strongly encouraged to work with the operating forces to integrate operational testing with training exercises, thereby bringing more resources to bear for the mutual benefit of both communities.

It is imperative that the T&E community engages the user community to assure that test strategies reflect the intended operational architectures and interfaces within which the intended capabilities are to be tested and evaluated.

9.1.5. Integrated T&E Philosophy

Integrating T&E consists of many aspects, all designed to optimize test scope and minimize cost. For example, separate contractor developmental testing might be combined with governmental developmental test and evaluation, with control being exercised by a combined test organization. Live testing might be integrated with verified, validated, and accredited simulators or computer driven models and simulations, to optimize the amount of live testing required. Another aspect is integrating developmental test and evaluation with operational test and evaluation into a continuum that reduces testing resource requirements and time, or conducting concurrent DT and OT when objectives and realism are compatible. Another approach is to combine DT and OT, discussed in paragraph 9.3.3 below, into a single test event, with data provided to developmental and operational evaluators equally. There is no single solution that is optimum for all programs, but each program should consider these approaches during initial T&E planning.

9.1.6. Systems Engineering and T&E

Systems engineering is discussed in depth in Chapter 4 of this Guidebook. In essence, systems engineering is a process to transform required operational capabilities into an integrated system design solution. As the design solution evolves, a verification component of the systems engineering process must provide confidence that the design solution properly addresses the desired capabilities, as intended.

T&E is the mechanism for accomplishing the verification loop in the SE process and characterizing technical risk of achieving a proper final design solution.

9.1.7. Environment, Safety, and Occupational Health

The T&E Strategy and TEMP should address the program manager's analysis of residual Environmental, Safety and Occupational Health (ESOH) risks and control measures, to include safety releases, for the system or item. The intent is to ensure that, prior to OT&E and fielding, the testers and users understand the ESOH hazards, the control measures adopted by the program manager, and the residual risks accepted by the program manager. Early participation of ESOH expertise on the T&E WIPT is recommended to assure appropriate issues are addressed during test planning and execution.

The program manager must ensure compliance with National Environmental Policy Act (NEPA)/E.O. 12114 requirements, particularly as they affect test ranges and operational areas. The T&E Strategy and TEMP should include NEPA/E.O.12114 documentation requirements, and describe how analyses will be conducted to support test site selection decisions.

DoD Instruction 5000.2, E5.1 requires the program manager to provide safety releases to developmental and operational testers prior to any test using personnel. A Safety Release communicates to the activity or personnel performing the test the risks associated with the test, and the mitigating factors required, ensuring safe completion of the test. A secondary function of the process is to ensure that due diligence is practiced with respect to safety in the preparation of the test by the sponsor. A Safety Release is normally provided by the program manager after appropriate hazard analysis. Safe test planning includes analysis of the safety release related to test procedures, equipment, and training. A full safety release is expected before IOT&E.

9.2. OSD Responsibilities

There are three organizations within the Office of the Secretary of Defense that have policy and oversight responsibilities for T&E within the Department. They are (1) the Director, Operational Test and Evaluation (DOT&E), who is the Principal Staff Assistant and advisor to the Secretary and the Deputy Secretary of Defense for the responsibilities and functions described below, and within the System Engineering Directorate of Defense Systems OUSD(AT&L), (2) the Deputy Director, Developmental Test and Evaluation (DT&E) who is responsible for developing DT&E policies and procedures, and (3) the Deputy Director, Assessments and Support (AS) who has direct interface with program managers on DT&E. These offices share or coordinate on the following responsibilities:

- Provide advice and make recommendations to the Secretary and Deputy Secretary of Defense and the USD(AT&L) and support OIPTs and DABs/ITABs for programs on the OSD T&E Oversight List;
- Develop, in consultation with the DoD Components, the OSD T&E Oversight List;
- Ensure the adequacy of test strategies and plans for programs on the OSD T&E Oversight List;
- Attend design readiness reviews;
- Monitor and review DT&E, OT&E, and LFT&E events of oversight programs;
- Participate in the operational test readiness process by providing recommendations about a system's readiness for OT&E;
- Provide independent performance, schedule, and T&E assessments to the DAES process; and
- Provide representatives to the T&E WIPT of oversight programs to assist program managers in developing their T&E Strategy and preparing the Test and Evaluation Strategy (TES) and Test and Evaluation Master Plan (TEMP).

9.2.1. Specific Responsibilities of the Director, Operational Test and Evaluation (DOT&E)

Specific responsibilities of the DOT&E are listed in DoD Directive 5141.2. For additional information on the DOT&E office and its functions, go to http://www.dote.osd.mil/.

9.2.2. Specific Responsibilities of the Office of the Deputy Director, Developmental Test and Evaluation (DD,DT&E)

Two offices in Defense Systems, both reporting to the Director, Systems Engineering, have DT&E responsibilities. The DS/SE/DTE office responsibilities are described on their website. The DS/SE/Assessments and Support (AS) office has direct interface with program managers. This office formally receives, staffs, and concurs on the TES and the TEMP, both described in section 9.6. Additionally, SE/AS recommends TES and TEMP approval to OIPT leaders, and advises OSD executive leadership on the adequacy of the DT&E of acquisition programs and the readiness of the program for IOT&E.

9.2.3. OSD T&E Oversight List

The DOT&E and the D, DS jointly, and in consultation with the ASD(NII), the DoD Component T&E executives, and other offices as appropriate, publish an annual OSD Test and Evaluation Oversight List. Programs on the list can be designated for DT&E, OT&E,

and/or LFT&E oversight. Any program, regardless of Acquisition Category level, can be considered for inclusion, and can be added to or deleted from the list at any time during the year. The current list can be obtained at the DOT&E Website). OSD criteria for determining whether or not a program should be on formal T&E oversight include:

- Acquisition category level;
- Potential for becoming an acquisition program (such as an Advanced Concept Technology Demonstration project or pre-MDAP);
- Stage of development or production;
- Whether program is subject to DAES reporting;
- Congressional and DoD interest;
- Programmatic risk (cost, schedule, performance);
- Past history of the developmental command with other programs;
- Relationship with other systems as part of a system-of-systems; and
- Technical complexity of system.

9.3. Developmental Test and Evaluation

9.3.1. DT&E Guidelines

A well planned and executed DT&E program supports the acquisition strategy and the systems engineering process, providing the information necessary for informed decision making throughout the development process and at each acquisition milestone. DT is the verification and validation of the systems engineering process and must provide confidence that the system design solution is on track to satisfy the desired capabilities. The T&E strategy should be consistent with and complementary to the Systems Engineering Plan. The T&E functional team should work closely with the system design team to facilitate this process. Rigorous component and sub-system developmental test and evaluation (DT&E) ensures that performance capability and reliability are designed into the system early. DT&E then should increase to robust, system-level and system-of-systems level testing and evaluation, to ensure that the system has matured to a point where it can meet IOT&E and operational employment requirements.

Robust DT&E reduces technical risk and increases the probability of a successful OT&E. During early DT&E, the test responsibility may fall to the prime contractor who will focus testing on technical contract specifications. To ensure that the systems engineering verification and validation relates back to user required capabilities, it is appropriate for government testers to observe the contractor testing and, when appropriate, to facilitate early involvement and contribution by users in the design and test processes. The program manager's contract with industry should support an interface between government testers and users with the contractors' testing. Commercial items, regardless of the manner of procurement, undergo DT&E to verify readiness to enter IOT&E, where operational effectiveness, suitability, and survivability for the intended military application are demonstrated. Programs should not enter IOT&E unless the DoD Components are confident of success.

Program manager s are required to develop and fund a T&E Strategy that meets the following objectives:

- Perform verification and validation in the systems engineering process;

- Develop an event-driven T&E Strategy, rather than a schedule-driven one, to ensure program success (required, DoD Instruction 5000.2);
- Identify technological capabilities and limitations of alternative concepts and design options under consideration to support cost-performance tradeoffs (required by DoD Instruction 5000.2). The intent is to avoid locking onto one solution too early;
- Identify and describe design technical risks (required by DoD Instruction 5000.2). The T&E Strategy should naturally flow from the systems engineering processes of requirements analysis, functional allocation, and design synthesis. For further explanation of this systems engineering flow-down, refer to paragraph 9.1.6 of this Guidebook;
- Stress the system under test to at least the limits of the Operational Mode Summary/Mission Profile, and for some systems, beyond the normal operating limits to ensure the robustness of the design (required by DoD Instruction 5000.2). This will ensure expected operational performance environments can be satisfied;
- Assess technical progress and maturity against Critical Technical Parameters (CTPs), including interoperability, documented in the TEMP (required by DoD Instruction 5000.2). As part of an event-driven strategy, the use of success criteria is a suggested technique with which program managers can meet this requirement. Success criteria are intermediate goals or targets on the path to meeting the desired capabilities. There are two uses of success criteria. First, they can be used to assess technical progress and maturity against CTPs. Second, they can be used as metrics to assess successful completion of a major phase of developmental testing, such as a major phase of ground testing or of flight testing, and determine readiness to enter the next phase of testing, whether developmental or operational. In the case of operational testing, these success criteria are tantamount to OT&E entrance criteria (required by DoD Instruction 5000.2) which are required for all operational tests. Technical parameters, such as levels of reliability growth or software maturity, increasing levels of weapons system accuracy, mission processing timelines, and the like, can be used as success criteria to assess technical progress. Alternatively, in the case of an event success criterion such as completion of the first set of missile test firings, the criteria can be a specified level of success, such as a percentage of successful missile firings from this group. Failure to meet this criterion might cause the program manager to decide on additional firings prior to transitioning to the next phase of testing. A program manager can use a combination of both types of success criteria and tailor them to best fit the program's T&E Strategy;
- Assess the safety of the system or item to ensure safe operation during OT&E, other troop-supported testing, operational usage, and to support success in meeting design safety criteria (required by DoD Instruction 5000.2). The intent is to ensure that developmental systems are sufficiently free of hazards to prevent injury to the typical users participating in OT&E and fielding;
- Provide data and analytic support to the decision process to certify the system ready for OT&E (required by DoD Instruction 5000.2). These data are provided in the DT&E report discussed below;
- Conduct information assurance testing on any system that collects, stores, transmits, and processes unclassified or classified information. The extent of IA testing depends upon the assigned Mission Assurance Category and Confidentiality Level. DoD Instruction 8500.2 mandates specific IA Control Measures that a system should implement as part of the development process. (required by DoD Instruction 5000.2);
- In the case of IT systems, including NSS, support the DoD Information Technology Security Certification and Accreditation Process and Joint Interoperability Certification process (required by DoD Instruction 5000.2)
- Discover, evaluate, and mitigate potentially adverse electromagnetic environmental effects (E3). (required by DoD Directive 3222.4)

- Support joint interoperability assessments required to certify system-of-systems interoperability; (required by DoD Directive 4630.5)
- In the case of financial management, enterprise resource planning, and mixed financial management systems, the developer shall conduct an independent assessment of compliance factors established by the Office of the USD(C) (required by DoD Instruction 5000.2);
- Prior to full-rate production, demonstrate the maturity of the production process through Production Qualification Testing of LRIP assets. The focus of this testing is on the contractor's ability to produce a quality product, since the design testing should already have finished. Depending on when this testing is conducted, the results might be usable as another data source for IOT&E readiness determinations; and
- Demonstrate performance against threats and their countermeasures as identified in the DIA-validated System Threat Assessment. Any impact on technical performance by these threats should be identified early in technical testing, rather than in operational testing where their presence might have more serious repercussions (required by DoD Instruction 5000.2).

In addition to the mandatory items above, the following items are strongly recommended to ensure a robust T&E program:

- Involve testers and evaluators, from within the program and outside, early in T&E planning activities to tap their expertise from similar experiences and begin identifying resource requirements needed for T&E budgeting activities;
- Ensure the T&E Strategy is aligned with and supports the approved acquisition strategy, so that adequate, risk-reducing T&E information is provided to support decision events;
- Utilize ground test activities, where appropriate, to include hardware-in-the-loop simulation, prior to conducting full-up, system-level testing, such as flight-testing, in realistic environments;
- The required assessment of technical progress should also include reliability, desired capabilities, and satisfaction of Critical Operational Issues (COIs) to mitigate technical and manufacturing risks;
- Increase likelihood of OT&E success by testing in the most realistic environment possible;
- Assess system-of-systems Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) prior to OT&E to ensure that interoperability under loaded conditions will represent stressed OT&E scenarios.

9.3.2. T&E Working Integrated Product Team (T&E WIPT)

To develop a T&E Strategy, a program manager should rely on a T&E WIPT. The T&E WIPT is a sub-group that reports to the Integrating IPT. It should be established as early as possible during Concept Refinement, and it should be chaired by a concept development team leader or program office representative. In addition, it should include a representative from the Operational Test Agency (OTA). It can consist of other representatives of any agency that the program manager directs, as it is his/her support team that has the collective mission of facilitating the successful planning and execution of the program's T&E activities. Membership often includes representatives from the program office, the combat developer, the independent Operational Test Activity, the intelligence community, the DoD Component T&E oversight agency, the Program Executive Office or its designated representative, and the contractor. For programs on the OSD T&E Oversight List, it is highly recommended that

OSD T&E oversight agencies, (SE/AS and DOT&E), be included. Program manager s should also consider forming lower level functional working groups, who report to the T&E WIPT, whose focus is on specific areas such as reliability scoring, M&S development and VV&A, threat support, etc. A charter should be developed early to, as a minimum, identify the responsibilities of the participating membership, and to describe the process by which the T&E WIPT will resolve issues. Two key products of this group are the Test and Evaluation Strategy and the Test and Evaluation Master Plan, both of which are discussed below. Working tools of the T&E WIPT include draft and final statements of desired capabilities, budget documentation, threat documentation, acquisition strategy and detailed DT, LFT and OT plans.

9.3.3. Combined DT&E and OT&E

Whenever feasible, DT&E and OT&E events should be combined, if that supports technical and operational test objectives to gain the optimum amount of testing benefit for reasonable cost and time. The user community should be involved early in test planning to ensure the statement of desired capabilities is interpreted correctly and tested realistically. Certain events can be organized to provide information useful to developmental and operational evaluators and lend themselves to the combined DT and OT approach. The concept is to conduct a single, combined test program that produces credible qualitative and quantitative information that can be used to address developmental and operational issues. Examples of this approach include combined DT and OT events, or piggybacking an operational assessment onto a developmental test. Likewise, developmental testing data requirements can be accommodated by an operational test. This approach can reduce the time and expense of conducting dedicated OT events that replicate DT events, or vice versa, yet still provide adequate technical risk reduction. The developmental and operational testers can develop a test management structure to share control of the combined events. Combined DT and OT events and test data requirements must be identified early to prevent unnecessary duplication of effort and to control costs. It is important that neither the DT&E nor OT&E objectives are compromised in designing combined events. For further explanation of this combined strategy, refer to the DAU Test and Evaluation Management Guide.

9.3.4. Modeling and Simulation in DT&E

Modeling and Simulation (M&S) is integral to and inseparable from T&E in support of acquisition. For T&E, M&S is an essential and proven tool. Each military department has extensive guidelines for use of M&S in acquisition and in T&E. These guidelines are intended to supplement other such resources.

The program manager should have an M&S WIPT that develops the program's M&S strategy. This M&S strategy, or "simulation support plan" will be the basis for program investments in M&S. M&S planned early in the program may retain its utility (if appropriately modified and updated) across the program's life. The planned M&S may be applicable to not only the first increment of an evolutionary acquisition, but to later increments, as well. A program's test strategy should leverage the advantages of M&S.

An initial goal for the T&E manager is to assist in developing the program M&S strategy. One focus should be to plan for architectures providing M&S interoperability and reusability across the program's life cycle. For example: integrate program M&S with the overall T&E Strategy; plan to employ M&S tools in virtual evaluations of early designs; use M&S to

demonstrate system integration risks; supplement live testing with M&S stressing the system; and use M&S to assist in planning the scope of live tests and in data analysis.

Another goal for the T&E manager is to develop a T&E Strategy identifying how to leverage program M&S to support T&E. This could include how M&S will predict system performance, identify technology and performance risk areas, and support determining system effectiveness and suitability. Some T&E Managers choose to develop a separate M&S support plan, which amplifies on the summary information contained in their TEMPs. The TEMP can then contain a pointer to this plan, thus reducing the size of the TEMP M&S discussion. There is no need to repeat the same information twice if an adequate plan exists.

A philosophy for interaction of T&E and M&S is to model-test-fix-model. Use M&S to provide predictions of system performance and effectiveness and, based on those predictions, use tests to provide empirical data to confirm system performance and to refine and validate M&S. This iterative process can be a cost-effective method for overcoming limitations and constraints upon T&E. M&S may enable a comprehensive evaluation, support adequate test realism, and enable economical, timely, and focused test.

With proper planning, simulation-based testing techniques can be applied to digital product descriptions (DPDs), system M&S, and hardware components, to predict system performance in support of early feasibility studies and design trade-off analyses. Test results provide data for validation and development of system M&S and DPDs. Virtual test beds and other M&S capabilities provide synthetic environments and stimuli for controllable, repeatable testing of components, software, and hardware throughout the acquisition cycle.

Computer-generated test scenarios and forces, as well as synthetic stimulation of the system, can support T&E by creating and enhancing realistic live test environments. Hardware-in-the-loop simulators enable users to interact with early system M&S. M&S can be used to identify and resolve issues of technical risk, which require more focused testing. M&S tools provide mechanisms for planning, rehearsing, optimizing, and executing complex tests. Integrated simulation and testing also provides a means for examining why results of a physical test might deviate from pre-test predictions. Evaluators use M&S to predict performance in areas that are impractical or impossible to test.

All M&S used in T&E must be accredited by the intended user (PM or OTA). Accreditation can only be achieved through a robust verification, validation, and accreditation (VV&A) process. Therefore, the intended use of M&S should be identified early so that resources can be made available to support development and VV&A of these tools. DoD Instruction 5000.61 provides further guidance on VV&A.

The iterative use of M&S and T&E can support spiral development and evolutionary acquisition of a system. Tests help to confirm system performance and validate M&S (which may be then immersed into synthetic environments) and support decision-making. Integrating M&S with testing generates more understanding of the interaction of the system with its environment than either M&S or testing alone. For best efficiency and validity, system M&S used in system test should be the same as, or traceable to, M&S used for concept development, analysis of alternatives, system design, and production. Synthetic test environments may also be reused for training, operations planning and rehearsal, and subsequent concept developments.

9.3.5. System Readiness for IOT&E

The DoD Components develop and institutionalize processes to determine a system's performance and readiness to enter IOT&E. These processes should focus on precluding systems from entering IOT&E prematurely by ensuring that they have demonstrated technical maturity under the conditions expected in the IOT&E.

For programs on the OSD OT&E Oversight List, the DoD Component Acquisition Executive (CAE) is required to evaluate and determine materiel system readiness for IOT&E. The intent of this requirement is to ensure systems do not enter IOT&E before they are sufficiently mature to handle the rigors of the operational environment. Scarce resources, including the military participants, are wasted when an IOT&E is halted or terminated because of technical problems with the system under test, problems that should have been discovered during robust DT.

As part of this system readiness process, programs on the OSD T&E Oversight List are required to provide OSD a DT&E report and progress assessment (required by DoD Instruction 5000.2) that supports entry into IOT&E. That report can be a written document or a briefing to DOT&E and to the DD, DT&E, as the USD(AT&L) representative,, that represents the DoD Component's position. The report should include the following: an analysis of the system's progress in achieving Critical Technical Parameters, to include reliability, if a requirement exists; satisfaction of approved IOT&E entrance criteria; a technical risk assessment; level of software maturity and status of software trouble reports; M&S results that project expected IOT&E results; and the predicted impacts of any shortcomings on the system's expected performance during IOT&E. Provide the report at least 20 days prior to the CAE's determination of system readiness. This will allow OSD time to formulate and provide its recommendation to the CAE. All appropriate developmental and operational test and evaluation organizations should be invited to the IOT&E readiness review.

9.4. Operational Test and Evaluation

9.4.1. OT&E Guidelines

DoD Instruction 5000.2 lists mandatory elements of OT&E planning and execution. Other considerations are included here:

The concept of early and integrated T&E should emphasize prototype testing during system development and demonstration and early OAs to identify technology risks and provide operational user impacts. OTAs should maximize their involvement in early, pre-acquisition activities. The goal of integrated T&E is to provide early operational insights into the developmental process. This early operational insight should reduce the scope of the integrated and dedicated OT&E thereby contributing to reduced acquisition cycle time and total ownership cost;

Appropriate use of accredited models and simulation to support DT&E, OT&E, and LFT&E should be coordinated through the T&E WIPT;

Planning should consider a combined DT&E, OT&E, and LFT&E approach. The combined approach should not compromise either developmental testing (DT) or operational testing

(OT) objectives. Planning should provide for an adequate OT period and report generation, including the DOT&E Beyond LRIP Report prior to the decision milestone;

The DoD Component OTA is responsible for OT&E, including planning, gaining DOT&E plan approval, execution, and reporting.;

OT&E uses threat or threat representative forces, targets, and threat countermeasures, validated by DIA or the DoD Component intelligence agency, as appropriate, and approved by DOT&E during the test plan approval process. DOT&E oversees threat target, threat simulator, and threat simulation acquisitions and validation to meet developmental, operational, and live fire test and evaluation needs;

Test planning should consider modeling and simulation (M&S). Test planners (DT&E, LFT&E, OT&E) should collaborate early with the program manager's M&S Proponent on the planned use of M&S to support or supplement their test planning or analyze test results. Where feasible, consideration should be given to the use or development of M&S that encompasses the needs of each phase of T&E. Test planners must coordinate with the M&S proponent/developer/operator to establish acceptability criteria required to allow verification, validation, and accreditation (VV&A) of proposed M&S. It is the responsibility of the program manager's M&S Proponent to ensure V&V is conducted in a manner that supports accreditation of M&S for each test event/objective. Whenever possible, an OA should draw upon test results with the actual system, or subsystem, or key components thereof, or with operationally meaningful surrogates. When actual testing is not possible to support an OA, such assessments may utilize computer modeling and/or hardware in the loop, simulations (preferably with real operators in the loop), or an analysis of information contained in key program documents. The TEMP explains the extent of M&S supporting OT&E; if M&S is to be developed, resources must be identified and cost/benefit analysis presented;

Naval vessels, the major systems integral to ship construction, and military satellite programs typically have development and construction phases that extend over long periods of time and involve small procurement quantities. To facilitate evaluations and assessments of system performance (operational effectiveness and suitability), the program manager should ensure the independent OTA is involved in the monitoring of or participating in all relevant activity to make use of any/all relevant results to complete OAs. The OTA should determine the inclusion/exclusion of test data for use during OAs and determine the requirement for any additional operational testing needed for effectiveness and suitability;

OTAs should participate in early DT&E and M&S to provide OT&E insights to the program manager, the Joint Capabilities Integration and Development System process participants, and acquisition decision makers;

OT&E will evaluate potentially adverse electromagnetic environmental effects (E3) and spectrum supportability situations. Operational testers should use all available data and shall review DD Form 1494, “Application for Equipment Frequency Allocation,” to determine which systems need field assessments; and

OT&E should take maximum advantage of training and exercise activities to increase the realism and scope of both the OT&E and the training, and to reduce testing costs.

9.4.2. Validation of Threat Representations (targets, threat simulators, or M&S)

To ensure test adequacy, operational testing should only incorporate validated, accredited threat representations unless coordinated with DOT&E.

The recommended validation guidelines are:

- Threat representation validation supports the objective of ensuring that threat representations meet DT&E and OT&E credibility requirements. Validation of threat representations is defined as "the baseline comparison of the threat to the threat representation, annotation of technical differences, and impact of those differences on testing"

- Validation of threat representations is typically conducted by the DoD Component responsible for the threat representation and culminates in a validation report which documents the results. DOT&E approves the DOD Component-validated reports;

- Only current, DIA-approved threat data should be used in the validation report. Specifications pertaining to the threat representation should accurately portray its characteristics and may be obtained from a variety of sources including the developer and/or government-sponsored testing. For new developments, validation data requirements should be integrated into the acquisition process to reduce the need for redundant testing;

- Incorporation of an IPPD process for new threat representation developments is recommended. The objective of the IPT is to involve DOT&E and its Threat Systems Office (TSO) early and continuously throughout the validation process. DoD Component organizations responsible for conducting threat representation validation should notify DOT&E of their intent to use an IPPD process and request DOT&E/TSO representation at meetings and reviews, as appropriate. The DOT&E representative will be empowered to provide formal concurrence or non-concurrence with these validation efforts as they are accomplished. After the IPPD process, DOT&E will issue an approval memorandum, concurring with the threat representation assessment;

- When a WIPT is not used, draft threat representation validation reports should be forwarded to the Threat Systems Office for review. TSO will provide recommendations for corrections, when necessary. Final reports are then submitted to the TSO for DOT&E approval;

- DOT&E approval confirms that an adequate comparison to the threat has been completed. It does not imply acceptance of the threat test asset for use in any specific test. It is the responsibility of the operational test agency to accredit the test resource for a specific test and for DOT&E to determine if the threat test resource is adequate; and

- These guidelines do not address the threat representation verification or accreditation processes. Verification determines compliance with design criteria and requires different methods and objectives. Accreditation, an operational test agency responsibility, determines the suitability of the threat representation in meeting the stated test objectives. The data accumulated during validation should be a primary source of information to support the accreditation process.

9.4.3. Evaluation of Test Adequacy

OT&E adequacy encompasses both test planning and test execution. Considerations include the following:

- Realistic combat-like conditions
  - Equipment and personnel under realistic stress and OPTEMPO
  - Threat representative forces
  - End-to-end mission testing
  - Realistic combat tactics for friendly and enemy
  - Operationally realistic environment, targets, countermeasures
  - Interfacing systems
- Production representative system for IOT&E
  - Articles off production line preferred
  - Production representative materials and process
  - Representative hardware and software
  - Representative logistics, maintenance, manuals
- Adequate resources
  - Sample size
  - Size of test unit
  - Threat portrayal
- Representative typical users
  - Properly trained personnel, crews, unit
  - Supported by typical support personnel and unit
  - Missions given to units (friendly and hostile)

9.4.4. Evaluation of Operational Effectiveness

Operational effectiveness is the overall degree of mission accomplishment of a system when used by representative personnel in the environment planned or expected for operational employment of the system considering organization, doctrine, tactics, survivability, vulnerability, and threat.

The evaluation of operational effectiveness is linked to mission accomplishment. The early planning for the evaluation should consider any special test requirements, such as the need for large test areas or ranges or supporting forces, requirements for threat systems or simulators, new instrumentation, or other unique support requirements.

For weapon systems, integrate LFT&E of system lethality into the evaluation of weapon system effectiveness. For example, operational testing could identify likely shot lines, hit points, burst points, or miss distances that might provide a context for LFT&E lethality assessments. Fuse performance, as determined under DT&E or otherwise, can provide a context for both OT&E and LFT&E assessments.

9.4.5. Evaluation of Operational Suitability

Operational suitability is the degree to which a system can be satisfactorily placed in field use, with consideration given to reliability, availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, manpower supportability, logistics supportability, documentation, and training requirements.

Early planning for the suitability evaluation should include any special needs for number of operating hours, environmental testing, maintenance demonstrations, testing profiles, usability of DT data, or other unique test requirements.

Operational suitability should be evaluated in a mission context in order to provide meaningful results. For example, maintaining a required OPTEMPO over an extended period while conducting realistic missions gives insight into the interactions of various suitability factors, such as the ability to maintain stealth features during sustained operations.

9.4.6. Evaluation of Survivability

Survivability includes the elements of susceptibility, vulnerability, and recoverability. As such, survivability is an important contributor to operational effectiveness and suitability. A survivability assessment should be conducted for all systems under OT&E oversight that may be exposed to threat weapons in a combat environment, whether or not the program is designated for LFT&E oversight. (For example, unmanned vehicles are not required to undergo survivability LFT&E under 10 USC 2366, but should be assessed for survivability.) The assessment may identify issues to be addressed by testing.

The DT&E, OT&E, and LFT&E strategies should be integrated so that the full spectrum of system survivability is assessed in a consistent manner. The Critical Operational Issues should include the issues to be addressed in the OT&E evaluation of survivability. Personnel survivability must be addressed for systems under LFT&E oversight (10 USC 2366) and should be integrated into the overall system evaluation of survivability conducted under OT&E.

Generally, vulnerability is addressed through LFT&E and susceptibility through OT&E, but there are areas of overlap. Realistic hit distributions are needed for the evaluation of LFT&E results. The OT&E evaluation of susceptibility might identify realistic hit distributions of likely threats, hit/burst points, and representative shot lines that might provide a context for LFT&E vulnerability assessments. Other LFT&E insights available from DT&E and OT&E testing of susceptibility might include information on signatures, employment of countermeasures, and tactics used for evasion of threat weapons. Similarly, LFT&E tests such as Full Ship Shock trials might provide OT&E evaluators with demonstrations of operability and suitability in a combat environment.

Recoverability addresses the consequences of system damage. Typically, recoverability is primarily addressed by LFT&E. However, in general, tests relating to recoverability from combat damage or from peacetime accidents, battle damage assessment and repair, crashworthiness, crew escape, and rescue capabilities are of interest to both LFT&E and OT&E.

Real Time Casualty Assessment (RTCA) conducted during IOT&E should be coordinated with LFT&E to ensure that assumptions supporting the RTCA are consistent with LFT&E results.

9.5. Live Fire Test and Evaluation

9.5.1. Objective

The objective of LFT&E is to provide a timely and reasonable assessment of the vulnerability/lethality of a system as it progresses through its development and prior to full-rate production. In particular, LFT&E should accomplish the following:

- Provide information to decision-makers on potential user casualties, vulnerabilities, and lethality, taking into equal consideration susceptibility to attack and combat performance of the system;

- Ensure that knowledge of user casualties and system vulnerabilities or lethality is based on testing of the system under realistic combat conditions;

- Allow any design deficiency identified by the testing and evaluation to be corrected in design or employment before proceeding beyond low-rate initial production; and

- Assess recoverability from battle damage and battle damage repair capabilities and issues.

The LFT&E Strategy for a given system should be structured and scheduled so that any design changes resulting from the testing and analysis, described in the LFT&E Strategy, may be incorporated before proceeding beyond low-rate initial production.

9.5.2. Covered Systems

"Covered syste" is the DoD term that is intended to include all categories of systems or programs requiring LFT&E. A "covered syste" means a system that DOT&E, acting for the Secretary of Defense, has determined to be a major system within the meaning of that term in 10 U.S.C. 2302(5) that is:

- user-occupied and designed to provide some degree of protection to its occupants in combat; or

- a conventional munitions program or missile program; or

- a conventional munitions program for which more than 1,000,000 rounds are planned to be acquired (regardless of whether or not it is a major system); or

- a modification to a covered system that is likely to affect significantly the survivability or lethality of such a system.

9.5.3. Early LFT&E

DOT&E approves the adequacy of the LFT&E Strategy before the program begins LFT&E. The program should be driven by LFT&E issues identified in the strategy, and be fully integrated with planned DT&E and OT&E. LFT&E typically includes testing at the component, subassembly, and subsystem level, and may also draw upon design analyses, M&S, combat data, and related sources such as analyses of safety and mishap data. This is standard practice, regardless of whether the LFT&E program culminates with full-up, system-level (FUSL) testing, or whether a waiver is obtained from FUSL testing. One of the purposes of conducting LFT&E early in the program life cycle is to allow time to correct any

design deficiency demonstrated by the test and evaluation. Where appropriate, the program manager may correct the design or recommend adjusting the employment of the covered system before proceeding beyond LRIP.

9.5.4. Full-Up, System-Level Testing (FUSL) and Waiver Process

The term, “full-up, system-level testing,” is the testing that fully satisfies the statutory requirement for “realistic survivability testing” or “realistic lethality testing” as defined in 10 USC 2366.The criteria for FUSL testing differ somewhat depending on whether the testing is for survivability or lethality. The following is a description of FUSL testing:

Vulnerability testing conducted, using munitions likely to be encountered in combat, on a complete system loaded or equipped with all the dangerous materials that normally would be on board in combat (including flammables and explosives), and with all critical subsystems operating that could make a difference in determining the test outcome; or

Lethality testing of a production-representative munition or missile, for which the target is representative of the class of systems that includes the threat, and the target and test conditions are sufficiently realistic to demonstrate the lethal effects the weapon is designed to produce.

The statute requires an LFT&E program to include FUSL testing unless a waiver is granted in accordance with procedures defined by the statute. A waiver package must be sent to the Congressional defense committees prior to Milestone B; or, in the case of a system or program initiated at Milestone B, as soon as practicable after Milestone B; or if initiated at Milestone C, as soon as practicable after Milestone C. Typically, this should occur at the time of TEMP approval.

The waiver package includes certification by the USD(AT&L) or the DoD Component Acquisition Executive that FUSL testing would be unreasonably expensive and impractical. It also includes a DOT&E-approved alternative plan for conducting LFT&E in the absence of FUSL testing. Typically, the alternative plan is similar or identical to the LFT&E Strategy contained in the TEMP. This alternative plan should include LFT&E of components, subassemblies, or subsystems; and, as appropriate, additional design analyses, M&S, and combat data analyses.

Programs that have received a waiver from FUSL testing are conducted as LFT&E programs (with exception of the statutory requirement for FUSL testing). In particular, the TEMP contains an LFT&E Strategy approved by DOT&E, and DOT&E, as delegated by the Secretary of Defense, submits an independent assessment report on the completed LFT&E to the Congressional committees as required by statute.

9.5.5. Personnel Survivability

LFT&E has a statutory requirement to emphasize personnel survivability for covered systems occupied by U.S. personnel (10 USC 2366). In general, personnel survivability should be addressed through dedicated measures of evaluation, such as "expected casualties" The ability of personnel to survive should be addressed even in cases where the platform cannot survive. If the system or program has been designated by DOT&E for survivability LFT&E oversight, the program manager should integrate the T&E to address crew survivability

issues into the LFT&E program supporting the Secretary of Defense LFT&E Report to Congress.

9.6. T&E Planning Documentation

The two top-level T&E planning documents are the Test and Evaluation Strategy and the Test and Evaluation Master Plan.

9.6.1. Test and Evaluation Strategy (TES)

9.6.1.1. Description

The TES is an early T&E planning document that describes the T&E activities starting with Technology Development and continuing through System Development and Demonstration into Production and Deployment. Over time, the scope of this document will expand, the TES will evolve into the TEMP due at Milestone B. The TES describes, in as much detail as possible, the risk reduction efforts across the range of activities (e.g., M&S, DT&E, OT&E, etc.) that will ultimately produce a valid evaluation of operational effectiveness, suitability, and survivability before full-rate production and deployment. It is a living document and should be updated as determined by the T&E WIPT during the Technology Development Phase. Its development will require early involvement of testers, evaluators, and others as a program conducts pre-system acquisition activities. These personnel will provide the necessary expertise to ensure nothing is overlooked in laying out a complete strategy. The TES should be consistent with and complementary to the Systems Engineering Plan.

The TES begins by focusing on Technology Development activities, and describes how the component technologies being developed will be demonstrated in a relevant environment (i.e., an environment of stressors at least as challenging as that envisioned during combat) to support the program's transition into the System Development and Demonstration Phase. It contains hardware and software maturity success criteria used to assess key technology maturity for entry into System Development and Demonstration. The TES is the tool used to begin developing the entire program T&E Strategy, and includes the initial T&E concepts for Technology Development, System Development and Demonstration and beyond. For programs following an evolutionary acquisition strategy with more than one developmental increment, the TES should describe how T&E and M&S would be applied to confirm that each increment provides its required operational effectiveness, suitability, and survivability, as would be required of a program containing only one increment. Its development establishes an early consensus among T&E WIPT member organizations on the scope of how the program will be tested and evaluated, with particular consideration given to needed resources, in order to support PPBE process activities.

9.6.1.2. Format

There is no prescribed format for the TES, but it should include the following items, to the extent they are known:

- Introduction and objectives of the system-specific technical and operational evaluations that will support future decision events;
- System description, mission, concept of operations, and major performance capabilities from the Initial Capabilities Document. Identify new technology and the plan to identify associated risk;

- Acquisition strategy concept - For programs following the preferred evolutionary acquisition strategy, the TES should describe how T&E and M&S would be applied to each increment. It should show how each increment would ultimately provide a demonstrated level of operational effectiveness, suitability, and survivability, and meet user needs with a measurable increase in mission capability;
- Time-phased threats to mission accomplishment;
- Anticipated concept of operations, including supportability concept;
- Technical risk reduction testing, including any new or critical technologies identified in the Technology Development Strategy;
- Anticipated component and sub-system developmental testing that begins after MS A;
- Test and evaluation strategy for System Development and Demonstration;
- Critical operational and live fire (if appropriate) issues;
- Scope and structure of the operational and live fire evaluations;
- Likely sources of required data;
- Major T&E design considerations;
- Hardware and software maturity success criteria;
- T&E schedule;
- Anticipated M&S used for future system evaluations; and
- T&E funding estimates in enough detail to permit programming and budgeting.

9.6.1.3. TES Approval Process

- For all programs on OSD T&E oversight, the program manager or leader of the concept development team, with the T&E WIPT providing support, must submit the DoD Component-approved TES to OSD for staffing and approval before Milestone A. Early involvement of testers will ensure a better product and will expedite the approval process, as issues will be addressed and resolved early through the IPPD process.
- It should be submitted 45 days prior to MS A so that an OSD-approved document is available to support the decision.
- The TES for an OSD T&E oversight program is submitted by the DoD Component TES approval authority to the DD, DT&E in the Office of the Director of Defense Systems. The DOT&E and the cognizant OIPT leader approve the TES for all programs on the OSD T&E Oversight List.
- OIPT leaders include the Director, Defense Systems and the Deputy to the ASD (Networks and Information Integration) for C3ISR and IT Acquisition. For programs not on the OSD T&E Oversight List, the CAE, or designated representative, approves the TES.

9.6.2.. Test and Evaluation Master Plan (TEMP)

9.6.2.1. Description

All programs on the OSD T&E Oversight List are required to submit for OSD approval a master plan that describes the total T&E planning from component development through operational T&E into production and acceptance. The program manager, with T&E WIPT providing support, is responsible for producing the TEMP. It is an important document in that it contains the required type and amount of test and evaluation events, along with their resource requirements. The TEMP is considered a contract among the program manager, OSD, and the T&E activities. The program manager must follow the approved TEMP to budget for T&E resources and schedules, which is why it is imperative that all T&E

stakeholders participate early in the T&E Strategy development and make timely updates when events or resource requirements change. Stakeholders should include representatives from USD(AT&L) (e.g., SE/AS) and DOT&E, as those offices ultimately will approve the TEMP. Their representatives can advise on what would constitute acceptable DT, OT, and, if appropriate, LF risk reduction strategies, and can ensure programs are satisfying statutory and regulatory T&E requirements.

While the program manager is responsible for developing the TEMP, the T&E WIPT should make every effort to complete the TEMP in a timely manner and resolve any outstanding issues and reach consensus. Each WIPT member should make every attempt to ensure its organization's issues are surfaced during WIPT meetings to avoid surprises during staffing. If the T&E WIPT cannot resolve all the issues, the program manager should not allow the issues to linger and let the T&E WIPT continue to debate. Instead, the program manager should raise the issues for resolution via the IPPD process.

The TEMP focuses on the overall structure, major elements, and objectives of the T&E program and must be consistent with the acquisition strategy, approved Capability Development Document or Capability Production Document, System Threat Assessment, and Information Support Plan. The TEMP should be consistent with and complementary to the Systems Engineering Plan. For a program using an evolutionary acquisition strategy, the TEMP must also be consistent with the time-phased statement of desired capabilities in the Capability Development Document or Capability Production Document. It provides a road map for integrated simulation, test, and evaluation plans, schedules, and resource requirements necessary to accomplish the T&E program objectives. The TEMP must also be consistent with DOT&E's intended schedule for complying with the statutory reporting requirements for OT&E and/or LFT&E, whether through the phased submittal of dedicated reports or on the Beyond-LRIP or LFT&E reports, or through DOT&E's Annual Report to the Congress. After MS B, no contractor or government testing should be conducted that is not identified in an approved TEMP, otherwise the program manager runs the risk of expending scarce resources on testing that might not be considered adequate by OSD.

9.6.2.2. Format

While there is no mandatory format for a TEMP, this Guidebook contains a suggested format that includes all required information. To provide a clear understanding of the program's overall T&E Strategy, and to ensure approval by OSD, it should contain the following information:

- A summary of the program, system description, and acquisition strategy;

- A listing of the Measures of Effectiveness and Suitability and the corresponding Critical Technical Parameters, along with their thresholds;

- A description of the T&E WIPT management structure, to include sub-level working groups, e.g., reliability, live fire, M&S. If a government-contractor combined test organization is planned, describe its purpose and composition, along with how it interfaces with the T&E WIPT. Distinguish between who is performing test management functions versus test execution or evaluation functions;

- An integrated T&E master schedule that describes the "big picture" and identifies the major testing activities and phases relative to decision points (e.g., milestone decisions and

Operational Test Readiness Reviews) and developmental phases. It must reflect the major phases of contractor and government DT&E, LFT&E, and OT&E events; preliminary and critical design reviews; and the major T&E reporting products, e.g., the DT&E report that supports IOT&E, IOT&E certification, interoperability certification, and Beyond LRIP Report;

- An expanded, detailed schedule that identifies the specific T&E events taking place during SDD (in a MS B TEMP or SDD update) or Production and Deployment (in a MS C TEMP update). For example, the detailed schedule would show specific types of testing such as flight tests, reliability testing periods, or natural environments testing.

- Plans to test and evaluate the system against threats and their countermeasures as identified in the System Threat Assessment and other supporting threat documentation;

- Descriptions of the T&E events for DT&E, OT&E, and LFT&E, including the number of and use of ground test assets and prototypes, and production test and evaluation, including the test purpose, scenario, sample sizes, test conditions, and limitations;

- Descriptions of assessments of system components (hardware, software, and human interfaces) critical to achieving and demonstrating contract technical performance and operational effectiveness, suitability, and survivability;

- System-level and system-of-systems-level test planning;

- Required success criteria (i.e., levels of Critical Technical Parameter maturity) with which to assess technical progress within a program phase;

- Methodologies and plan to be used for verifying, validating, and accrediting M&S, where appropriate, to aid in the system's design, provide insights into system performance, produce pretest predictions and modification of M&S based on test results, and to optimize the amount, duration, and cost of live testing. Explain the extent of M&S supporting DT&E, OT&E, and LFT&E;

- Plans for developing an interoperability certification strategy and test plan (i.e. Interoperability Test Plan and/or Interoperability Certification Evaluation Plan) and demonstrating interoperability with other systems, including meeting the interoperability KPP, and for obtaining interoperability certification by the full-rate production decision review;

- A matrix that identifies all tests within the LFT&E strategy, their schedules, the issues they will address, and which planning documents the DoD Component s will submit to DOT&E for approval and which will be submitted for information and review only;

- A capabilities crosswalk matrix depicting the flow-down of desired capabilities from the Initial Capabilities Document to Capability Development Document or CPD, then to the Measures of Effectiveness, Suitability, and Survivability, and finally the Critical Technical Parameters to ensure all desired capabilities will be evaluated;

- A reliability growth plan that describes the testing and anticipated reliability growth of the system throughout its development;

- OT&E entrance criteria for all OT events;

- T&E implications of information assurance;

- Resource requirements, including T&E budget and required funding, test assets, M&S support, facilities, test participants, instrumentation, data reduction capability, expendables, with any shortfalls highlighted. Required threat resources and test targets must also be included. This section of the TEMP is critical to the overall success of the program. It must be as complete and as accurate as possible in reflecting the T&E resource requirements and budget required for T&E. Program T&E problems can often be traced to poor T&E resource requirement definition at the beginning of a program or failure to reprogram T&E resources as program schedules change. When program schedule changes occur, it is imperative that the TEMP is updated and that T&E resources are reprogrammed. Failure to consider T&E resource implications before allowing schedule changes, and failure to reprogram the required T&E resources are often the cause of problems between the developmental and T&E communities.

9.6.2.3. Approval Process

- The TEMP for an OSD T&E oversight program is submitted by the DoD Component TEMP approval authority to the DD, DT&E. The DOT&E and the cognizant OIPT leader approve the TEMP for all programs on the OSD T&E Oversight List. For other programs, the CAE, or designated representative, approves the TEMP.

- For OSD T&E oversight programs, the DD, DT&E staffs the document through appropriate OSD organizations for coordination, formally concurs on the adequacy of the TEMP, and then forwards it to the cognizant OIPT leader and DOT&E for approval. For programs not on OSD T&E oversight, the document is submitted to the CAE for approval.

- A TEMP must be submitted not later than 45 days prior to the Milestone decision point or subsequent program initiation if a PM must have an OSD-approved document by the decision date. For programs newly added to the OSD T&E Oversight List, the TEMP must be submitted within 120 days of such written designation.

9.6.2.4. TEMP Updates

TEMPs are required to be updated at Milestone C and the Full Rate Production Decision Review, but should also be updated when the program baseline has been breached, when the associated Joint Capabilities Integration and Development System document or ISP has been significantly modified, or on other occasions when the program is significantly changed or restructured. Evolutionary acquisition programs may require additional updates to ensure that the TEMP reflects the currently defined program. When a program baseline breach occurs, the TEMP should be updated within 120 days of the date of the program manager's Program Deviation Report to ensure it reflects the restructured program. When a program changes significantly, the TEMP due date will be negotiated between the program manager and the component TEMP approval authority. In the case of programs under OSD T&E oversight, the negotiations will take place between the program manager, DoD Component TEMP approval authority, SE/AS, and DOT&E. In either case, the goal should be to update the TEMP within 120 days.

9.6.2.5. Circumstances When a TEMP is No Longer Required

When a program's development is completed and COIs are satisfactorily resolved, including the verification of deficiency corrections, TEMP updates are no longer required. The following attributes are examples for which an updated TEMP submission may no longer be required:

- Fully deployed system with no operationally significant product improvements or increment modification efforts;

- Full production ongoing and fielding initiated with no significant deficiencies observed in production qualification test results;

- Partially fielded system in early production phase having successfully accomplished all developmental and operational test objectives;

- Programs for which planned test and evaluation is only a part of routine aging and surveillance testing, service life monitoring, or tactics development;

- Programs for which no further operational testing or live fire testing is required by any DoD Component;

- Program for which future testing (e.g., product improvements or incremental upgrades) has been incorporated in a separate TEMP (e.g., an upgrade TEMP).

9.6.2.6. Requesting Cancellation of TEMP Requirement

Written requests for cancellation of a TEMP requirement for a program on OSD T&E oversight must be forwarded through the DoD Component TEMP approval authority to the OIPT leader (through SE/AS). Justification, such as applicability of any the above circumstances, must be included in the request. The OIPT leader will jointly review the request with DOT&E and notify the DoD Component TEMP approval authority of the result.

9.7. T&E Reports

9.7.1. DoD Component Reporting of Test Results

Programs designated for OSD T&E oversight are required by DoD Instruction 5000.2 to provide formal, detailed, reports of results, conclusions, and recommendations from DT&E, OT&E, and LFT&E to DOT&E and USD(AT&L) (or ASD(NII), as appropriate). For those reports supporting a decision point, the report should generally be submitted 45 days before the decision point.

All developmental and operational T&E agencies shall identify test and evaluation limitations. Their assessment should include the effect of these limitations on system performance, and on their ability to assess technical performance for DT&E or operational capabilities for OT&E.

9.7.2. LFT&E Report

DOT&E monitors and reviews the LFT&E of each covered system. At the conclusion of LFT&E, the Director prepares an independent assessment report that:

- Describes the results of the survivability or lethality LFT&E, and

- Assesses whether the LFT&E was adequate to provide information to decision-makers on potential user casualties and system vulnerability or lethality when the system is employed in combat, and to ensure that knowledge of user casualties and system vulnerabilities or lethality is based on realistic testing, consideration of the validated statement of desired operational capabilities, the expected threat, and susceptibility to attack.

DOT&E prepares the OSD LFT&E Report within 45 days after receiving the DoD Component LFT&E Report, which is required by DoD Instruction 5000.2. The Secretary of Defense (or DOT&E if so delegated) submits the OSD LFT&E report to Congress before a covered system proceeds beyond LRIP (10 USC 2366). If the system is designated for both OT&E and LFT&E oversight, DOT&E may choose to combine the LFT&E and Beyond LRIP reports under single cover, so as to better integrate the reporting of LFT&E and OT&E.

9.7.3. Beyond-Low Rate Initial Production (LRIP) Report

To meet the statutory requirements of 10 USC 2399, DOT&E analyzes the results of IOT&E conducted for each MDAP and DOT&E-designated program. At the conclusion of IOT&E, the Director prepares a report stating the opinion of the Director as to:

Whether the T&E performed were adequate; and

Whether the results of such T&E confirm that the items or components actually tested are effective and suitable for combat.

The Director submits Beyond-LRIP reports to the Secretary of Defense, USD(AT&L), and the congressional defense committees. Each such report is submitted to those committees in precisely the same form and with precisely the same content as the report originally was submitted to the Secretary and USD(AT&L) and shall be accompanied by such comments as the Secretary may wish to make on the report. A final decision within the Department of Defense to proceed with an Milestone Decision AuthorityP or DOT&E-designated program beyond LRIP may not be made until the Director has submitted to the Secretary of Defense the Beyond-LRIP Report with respect to that program and the congressional defense committees have received that report (10 U.S.C. 2399).

If the report indicates that either OT&E was inadequate or that the system as tested was ineffective or unsuitable, DOT&E will continue to report his/her assessment of test adequacy and system operational effectiveness and suitability, based on FOT&E, in the DOT&E Annual Report.

In evolutionary acquisition programs that conduct a separate IOT&E for successive development configurations or increments, DOT&E may submit separate BLRIP reports, or if the scope of the configuration change is minimal, may use the DOT&E annual report for the purpose of notifying Congress and the Secretary.

9.7.4. DOT&E Annual Report

DOT&E prepares an annual OT&E and LFT&E report, in both classified and unclassified form, summarizing all OT&E and LFT&E activities, and addressing the adequacy of test resources within the Department of Defense during the previous fiscal year (10 U.S.C. 139).

The report includes the status of information assurance, E3, and interoperability for each program (Pub.L. 107-314, Sec. 235). The report also includes an assessment of the waivers of and deviations from requirements in test and evaluation master plans and other testing requirements that occurred during the fiscal year, any concerns raised by the waivers or deviations, and the actions that have been taken or are planned to be taken to address the concerns. DOT&E submits the reports concurrently to the Secretary of Defense, USD(AT&L), and Congress, within 10 days of the President's Budget to Congress.

9.7.5. Electronic Warfare (EW) T&E Report

House Report 103-357 (1993) requires the Secretary of Defense to develop a DoD T&E Process for EW Systems and to report annually on the progress toward meeting this process. DoD memorandum, "Designation of Programs for OSD Test and Evaluation (T&E) Oversight" promulgates the reporting procedure, the list of EW programs required to report, and report format. Designated programs shall submit a one-page status report, through DoD Component channels, to the Deputy Director, SE/AS, Office of the Director, Defense Systems, Office of the USD(AT&L), by November 15th of each year.

9.8. Best Practices

9.8.1. DT&E Best Practices

In the past, some programs have succeeded with their DT&E activities and fared better in Operational Test, while others have struggled. The successful ones share common characteristics or lessons learned. These “best practices” are offered for Program Managers to increase the likelihood of a successful T&E program.

9.8.1.1. Recognize the Value of T&E

T&E is a key part of the system engineering process. It is the validation step in the feedback loop for system design. Use T&E to understand risk and help determine technical issue areas. Review the T&E progress (planning, testing, metrics) often. Look for trends in problems and make appropriate adjustments in overall program priorities. Positive test results will give you confidence that your early designs are valid. Failures in test, when discovered and acted on early in development will result in a better product at less cost - advantages you would not experience if you did not conduct the T&E. Studies have revealed that roughly 75% of life cycle costs of a program are fixed as a result of the initial design process. Obviously, the longer you wait to discover deficiencies, the more it will cost to implement changes. Spending the time and money early in a program for a rigorous test program will save time and money later.

9.8.1.2. Pick a Strong T&E Manager Early

This individual must be a leader - good at group dynamics, resolving conflict, and forging consensus. T&E experience is a plus, but the other characteristics are key. This individual should be named early in program office organizational staffing, and charged to put in place a rigorous test strategy to carry across the life of the program. Empower this individual to run the T&E program and provide direct access to the Program Manager.

9.8.1.3. Learn and Communicate

Learn the necessary procedures and strategy to develop a sound test strategy. Have the T&E manager become an expert on the T&E aspects of DoD Instruction 5000.2 and this Guidebook. Extended TEMP approval cycles can easily be avoided by having the T&E manager, and preferably others in the T&E organization, knowledgeable of what is required and expected. If there is a question on any DoD Instruction 5000.2 T&E requirement, T&E managers should contact the SE/AS office, or DOT&E as appropriate, for clarification. Consult with the OSD SE/AS office staff early; ask for advice on special problems, selecting metrics, etc. Early discussions will go a long way to setting the right course to facilitate a good test program.

9.8.1.4. Establish and Use a T&E WIPT

Encourage the T&E manager to create and use the collaborative power of the IPPD process. Assemble the user representative, developmental and operational testers, evaluators, and various special experts (information assurance, for example) early to help create the test strategy. Empower the T&E leader to work the WIPT and bring the WIPT group together often-not only to support milestone required documentation, but also to review progress and results.

9.8.1.5. Embed T&E in the Acquisition Strategy, and Vice Versa

The T&E Strategy must support the acquisition strategy. Assure the T&E Master Plan is framed around the acquisition strategy, but also allow T&E to support the acquisition strategy. An example is schedule: allow sufficient schedule for finding problems in testing, fixing them, and retesting.

9.8.1.6. Make "Openness" Your Policy

Facilitate open communications. The IPT process will facilitate this practice. For example: open test planning to a wide cross section of the T&E community; invite the user and the operational tester to witness DT activity; share data and findings with the user and the evaluators; bring the user into the prioritization process for addressing problems; ask for advice from other programs and the OSD Acquisition staff in resolving T&E issues.

9.8.1.7. Develop a Good T&E Strategy

The documentation involved is the TES and the TEMP. Together they represent the test and evaluation program strategy. Ensure the strategy contains a realistic schedule, rigorous and robust technical and operational testing, and is adequately resourced. Put them together early, but also carefully and in sufficient detail. Assure the test program responds to desired system capabilities -metrics should measure progress toward achieving the desired capabilities. Consider incremental success measures to assess progress across the development phase. Bring the user into the planning, to assure the test metrics properly reflect the user's statement of desired capabilities. Align DT & OT. Results of DT should link directly to confidence in entering OT. Introduce operational architectures, operators, and stress into DT parameters when prudent. Track reliability across the entire test program. Look in DT for reliability indicators to exceed required levels, because the stress and environment is usually less severe in DT. Do not assume each test will be successful. Follow the paradigm of: test-fix-retest to verify fixes. Allow schedule time to fix problems and retest.

9.8.1.8. Stick with the Plan

When technical problems arise in DT&E that consume planned test schedule time, program managers should consider restructuring a program schedule to add additional time to accomplish DT&E events. Do not drop testing to save time. Schedule additions when technical problems first arise are less problematic than having to add schedule time late in a program. Avoid the tendency to sacrifice test events to pay for Program budget cuts, or to pay for schedule pressure resulting from slow development progress. Such action invariably will result in higher overall program costs, because discovery of problems will be delayed.

9.8.1.9. Exploit Modeling and Simulation (M&S)

M&S technology is here to stay. It is a fundamental part of all product design and development. It is also a fundamental part of T&E. Seek synergy between system design/development applications of M&S, and T&E applications. Look for opportunities for M&S reuse across the program life cycle. Employ the paradigm of Guidebook Chapter. Planning and investment in M&S should be done early in the program, including M&S for T&E.

9.8.1.10. Employ Event-Driven T&E Strategies

Programs face the dilemma of choosing between a schedule-driven DT&E program, due to funding considerations and demanding IOC dates, and an event-driven program designed to reduce technical risk. The temptation is to focus on the perceived short term benefits of schedule-driven strategies, but in the long run, programs with the discipline to develop and follow event-driven strategies tend to be more successful. This is because perceived short-term benefits are often overcome by the technical risks that programs take. However, the more successful programs tend to maintain an event-driven strategy and proceed from one T&E event to the next only when testing objectives have been accomplished and success criteria have been satisfied. One planned event is successfully completed prior to advancing to the next.

9.8.1.11. Incorporate Operational Realism in DT&E

DT planning should consider operational realism when practical. Introduce operational environments, uniformed operators, and even typical scenario stresses early to gain understanding of potential performance and human factor issues. Look for opportunities to combine DT events with operational assessments and tests. Early user involvement in DT&E has demonstrated exceptional value by providing user insights early into the design process. Operational realism in DT&E will also build confidence in preparing for IOT&E.

9.8.1.12. Work with the OSD DD, DT&E Office

SE/AS is responsible for monitoring program progress and keeping senior OSD AT&L leadership informed. Programs on OSD SE/AS oversight should establish a rapport with the OSD SE/AS office early on to enlist their help in planning a robust T&E Strategy and to help work through the predictable technical and schedule problems that arise with all programs. The SE/AS office should be a member of the program's T&E WIPT, and they should be participants in the program's developmental and operational test readiness review process. They, and their counterparts in the Defense Systems warfare offices, should be kept

apprised of technical problems as they arise so that they can aid in the resolution. Their expertise from supporting programs of all DoD Component s can provide lessons learned on similar problems and suggestions on remedial actions. Timely information flow is very important; keep SE/AS apprised of all significant test event results, both successes and failures.

9.8.1.13. Apply Appropriate Commercial Practices

The OSD SE/AS office has published a study report on commercial best practices in T&E. Consider these T&E best practices of commercial industry, and apply them as appropriate. Most of the commercial best practices are logical, and application to defense programs is readily understandable. A sample listing of these best practices follows:

- Recognize that testing is a way to identify and solve problems early in the process in order to control time, cost and schedule late in the process;
- Stabilize corporate leadership and test staff and commit to T&E as a key enabler. Military billet rotation demands that the TES and TEMP be current and document agreements between the OTA, program manager and Milestone Decision Authority;
- Develop consistent processes to ensure consistent products;
- Ensure T&E is consistently part of the decision, planning, and execution process;
- Early commitment by all stakeholders on required T&E resources;
- Certification of T&E processes and organizations (~ISO 9000);
- Increase T&E to assure product quality rather than reduce it to save T&E cost;
- Use metrics and quality control processes to understand how well test process is operating;
- Automate data collection and archiving;
- Use measurements and metrics;
- Continue to increase the use of modeling and simulation to expand the evaluation context based on verified test data;
- Correlate faults and solutions in a closed loop process to ensure problems are resolved;
- Use Physics of Failure as a tool to predict and analyze system performance and shortfalls; and
- Establish internal web based sites for exchange of ideas, benchmarks, data, applications, and processes.

9.8.1.14. Engage Specialists Early

Certain specialty areas, such as information system security, information assurance, interoperability, human systems integration, and software reliability, require early attention. Invite consultation with technical experts (DISA, JITC, OSD SE/AS, etc) to help plan the most efficient test program to build confidence in system maturity.

9.8.1.15. Leverage Other System T&E Planning to Benefit Your Program

Seek out other systems that may compete for similar test resources and combine test activities where practical. Extend this thinking to other areas, such as training. For example, by pursuing built-in test equipment, effective testing can be accomplished in coordination with training.

9.8.1.16. Learn from Others

Contact similar programs, including those of other DoD Component s, to learn the lessons of their experience. Take advantage of their successes and avoid repeating their failures.

9.8.1.17. Be Ready for IOT&E

Program managers should not allow their system to enter IOT&E without first being confident that they will succeed.

9.8.2. OT&E Best Practices

- Provide for an integrated DT/OT/LFT&E evaluation, using a phased approach that identifies key decision points and that generates timely and objective information for decision makers on the system's demonstrated capabilities to date (i.e., learn something each year).

- In planning for the operational evaluation, focus on the mission(s) that will be accomplished by a unit or crew equipped with this system. Identify the operational capabilities that will be critical to mission accomplishment. (This starts a "top-down" methodology leading to COIs, MOEs, critical LFT&E issues, and other evaluation issues, measures of performance, and data requirements. These are ultimately to be "rolled back up" to assess the degree of mission accomplishment. The resulting OT&E concept will link mission accomplishment to the key operational capabilities that are identified in the Joint Capabilities Integration and Development System documents as the basis for accepting the system.)

- During planning, consider how the system will be employed to accomplish the mission(s) previously described. Describe the steps of a complete mission cycle, from mission tasking through successful execution and return. Consider organizational structure; tactics, techniques, and procedures (TTP); training; and any required supporting systems. This provides a "system-of-system" perspective that gives insight into any important interoperability requirements. Determining the appropriate external systems, measures, operational context, and mix of live virtual and constructive resources will depend on the particular system and situation.

- For programs using evolutionary acquisition, the ultimate functionality may or may not be defined at the beginning of the program. Each increment, however, must provide a militarily useful and supportable operational capability, with thresholds and objectives set by the user. The T&E Strategy should provide for an evaluation of the ability of each increment to meet the user's thresholds and evaluate the potential for growth. Comparisons of the capabilities of the legacy system or baseline and the planned increment may assist in evolutionary acquisition by answering the question of whether the new increment provides enough of an improvement in mission capability to warrant fielding to the force.

- For software-intensive systems, follow the DOT&E Guidelines for Conducting Operational Test and Evaluation (OT&E) for Software-Intensive System Increments.

- During planning, the study of the mission, desired performance capabilities, employment concept, and studies such as AOAs, lead to a set of critical operational issues (COIs) and critical LFT&E issues whose satisfactory resolution is vital to the system's operational

effectiveness, suitability, and survivability evaluation. The COIs should be few in number, operational in nature, observable, and testable. They should address mission accomplishment and survivability at a level (e.g., ship, flight, unit) appropriate to the evaluation required. The COIs should include measurable improvements to the baseline or current mission capability.

- Whenever applicable, provide a measurable means for comparisons to a baseline system. Baseline comparisons can reduce risk to the program by demonstrating possible improvement in overall mission capability even if certain technical performance requirements are not met. Use of a baseline may reduce risks to test adequacy by compensating for unexpected problems with test environment, training of the test unit, or data collection. Finally, comparisons to the baseline system can demonstrate the degree to which the original deficiencies (in terms of mission accomplishment) have been corrected.

- Identify proposed sources of data for the MOEs and MOPs associated with each COI, LFT&E issue, and secondary evaluation issue. In addition to the IOT&E, consider other operational events, as well as live fire tests, key developmental test events, modeling and simulation, dedicated side tests, excursions, and "piggy-backin" on training or other planned testing opportunities. Look for opportunities to integrate LFT&E and OT&E.

- Realistically stress systems during developmental testing. Do not let IOT&E be the first time that the system is exposed to operationally realistic environments.

- Test in extreme environments - chambers are necessary but not sufficient to understand system capabilities and limitations.

- Involve the Operational Test Agencies, intelligence agencies, and OSD (for OSD oversight programs) early in the program design stages.

9.8.3. LFT&E Best Practices

9.8.3.1. Pretest Predictions

Pretest predictions are standard practice for every live fire test event. The predictions may be based on computer models, engineering principles, or engineering judgment, and should address a level of detail comparable to the test damage assessment methodology. The DOT&E-approved LFT&E Strategy should address both the nature of the pretest predictions and the schedule of pretest prediction deliverables. The deliverables and supporting documentation should identify basic assumptions, model inputs, and known limitations. If the live fire evaluation plan incorporates the use of vulnerability or lethality models, the pretest predictions should exercise those models, and support the verification, validation, and accreditation of those models. Adequate time and resources should be planned to support pre-test predictions and post-test reconciliation of models and test results.

9.8.3.2. Evaluation Measures

Although the evaluation of live fire test results will address kill given a hit (i.e., vulnerability or lethality), the outcome of LFT&E is not necessarily expressed in terms of probabilities. Rather, live fire testing typically addresses vulnerability or lethality primarily by examining basic damage and kill mechanisms and their interactions with the target system. Further, the evaluation of vulnerability test results should address, where possible, the susceptibility and recoverability of the system and be integrated with results of OT&E.

9.9. Special Topics

9.9.1. Interoperability

For IT systems, including NSS, with interoperability requirements, the JITC is required to provide system Net-Ready certification memoranda to the Director, Joint Staff J-6, throughout the system Life-cycle and regardless of Acquisition Category. Based on net readiness evaluations and other pertinent factors, the Joint Staff J-6 shall issue Net-Ready system certification memoranda to the respective DoD Components and developmental and operational test organizations in support of the full-rate production decision review.

Net readiness applies to C4ISR systems and to any weapon or system that shares data. In general, every system is required to have a Net-Ready KPP and be certified for net readiness. Net-Ready certification is required for a FRP decision, and acceptable net readiness must be demonstrated prior to a Milestone C LRIP decision and IOT&E. In addition, systems will be tested and evaluated periodically over their life cycle for net readiness.

As with most other aspects of a system, net readiness is an early consideration for design and test. The strategy for testing net readiness should be included in the TEMP. An important aspect is to develop a strategy for testing each system in the context of the system-of-systems, or family-of-systems architecture within which it is required to operate.

The Department's test organization for net readiness is the Joint Interoperability Test Command. JITC is the agency that will facilitate a system's Net-Ready certification. The philosophy employed by JITC is to leverage other planned test events to generate necessary data for Net-Ready certification. A special test will be necessary only if other events do not provide the appropriate data. It is important that JITC be included as a member of the T&E WIPT, and participates in the TEMP development.

9.9.2. Information Assurance (IA) T&E Considerations

The test and evaluation of information assurance requirements is an integral part of the overall T&E process. DoD Instruction 5000.2 directs that IA testing be conducted during both DT&E and OT&E. The key aspects of IA include availability, integrity, confidentiality, authentication, and non-repudiation. Key considerations for the planning, coordination and execution of IA testing include the following:

9.9.2.1. Sources of IA Requirements

To ensure that IA testing adequately addresses all system IA requirements, all sources of IA requirements must be considered. These sources include the applicable capabilities documents (e.g., Initial Capabilities Document, Capability Development Document, Capability Production Document, the former ORD, etc.), the applicable IA Baseline Controls are described in DoD Instruction 8500.2 as IA Control Measures. Additional requirements may be derived from the risk management process.

9.9.2.2. Integration of Certification and Accreditation Activities

It is important to consider the impact of the DoD Information Technology Security Certification and Accreditation (C&A) Process (DITSCAP) on the overall test and evaluation schedule. An Interim Authority to Operate (IATO) or Authority to Operate (ATO) is required prior to conducting operational test. These authorities are granted only after the bulk of C&A activities are concluded, and the Designated Approving Authority (DAA) is satisfied with the residual risk to the system. Significant C&A activities and events should be visible on the integrated test schedule to ensure appropriate coordination of events. See paragraph 7.4.4. for additional information.

9.9.2.3. IA Considerations for the TEMP

IA has become increasingly important to joint operations and effective defense system performance. The success of net-centric warfare will depend to a great extent upon information assurance. It is important to address IA in the TEMP. IA roles and responsibilities, test strategies and summaries, and special resources should all be addressed. For example: identify the DAA, and include IATO/ATO as entrance criteria for appropriate test events. OTAs should evaluate protection mechanisms (IA Controls) and the ability to detect system or information attack and subsequently respond and restore systems and information.

9.9.3. Electromagnetic Environmental Effects Testing

Electromagnetic Environmental Effects (E3) can adversely affect the operational effectiveness of military forces, equipment, systems, and platforms. Additionally, today's complex military operational environment is characterized by an increasingly congested electromagnetic spectrum coupled with a reduction of spectrum allocated for exclusive military use. The mix of DoD-developed and commercial-off-the-shelf electronic equipment increases the importance of effectively managing E3 and spectrum usage in the battle space. It is the responsibility of the program manager to ensure, and the responsibility of the Developmental and Operational Test Agencies to validate, the readiness of systems to be fielded into this environment. Historically, failure to verify equipment/platform electromagnetic compatibility in the item's intended operational electromagnetic environment have caused costly program delays and reduced operational effectiveness.

A series of evaluations should be conducted to demonstrate that an item's engineering design is complete and sound, that E3 have been effectively controlled and that E3 limitations and vulnerabilities have been identified and documented. These evaluations and the associated test requirements vary depending on the item under consideration and the operational EME associated with its intended use. General test requirements and guidelines for electromagnetic compatibility are contained in MIL-STD-461. E3 requirements for systems can be found in MIL-STD-464 and MIL-HDBK-237. These evaluations should be initiated at the earliest practical point in the item's Life-cycle so that deficiencies can be identified early and corrected. program managers are encouraged to contact their DoD Component E3 representatives to establish an E3 control and evaluation plan for their acquisition program.

9.9.3.1. Hazards of Electromagnetic Radiation to Ordnance (HERO)

In DoD terminology, the hazards that result from adverse interactions between radio frequency (RF) emitters and electrically initiated devices or initiating systems contained within ordnance systems (e.g., fuses) are referred to as HERO. Where applicable, HERO

tests should be conducted to determine if exposure of electrically initiated ordnance to specified EME levels will adversely affect the ordnance. The general approach for HERO testing is to expose inert, instrumented ordnance to a controlled test EME and to monitor each EID contained within the ordnance for a possible response. For most EIDs, the response is quantified in terms of the magnitude of RF current induced into the heating element, or bridge wire, of the device. A common objective in all HERO testing is to determine the maximum or worst case response at various test frequencies for various ordnance physical configurations. HERO testing should emphasize exposure of the ordnance to the EME levels that are associated with each operational phase of an ordnance item to include assembly/disassembly, staged, handling and loading, platform loaded, immediate post launch, transportation and storage. Detailed guidance on HERO testing can be found in MIL-HDBK-240, "HERO Test Guide"

9.9.3.2. Hazards of Electromagnetic Radiation to Personnel (HERP)

A potential hazard can exist when personnel are exposed to an electromagnetic field of sufficient intensity to heat the human body. The potential for electromagnetic radiation to produce harmful biological effects in humans is referred to as HERP. Radar and electronic warfare systems present the greatest potential for personnel hazard due to their high transmitter output powers and antenna characteristics. Where applicable, HERP tests should be conducted to establish safety tolerance levels for exposure to EMR as defined in DoD Instruction 6055.11.

9.9.3.3. Hazards of Electromagnetic Radiation to Fuels (HERF)

An electromagnetic field of sufficient intensity can create sparks with sufficient energy to ignite volatile combustibles, such as fuel. The potential for electromagnetic radiation to cause ignition or detonation of volatile combustibles, such as fuels, is referred to as HERF. The existence and extent of a fuel hazard are determined by comparing the actual RF power density to an established safety criterion. When applicable, HERF tests should be conducted to establish safe operating distances as defined in T.O. 31Z-10-4 and OP 3565.

9.9.4. Support for Joint Munitions Effectiveness Manuals (JMEMs)

Each DoD Component should provide weapons effectiveness data for weapons in the acquisition process to DOT&E for use in the Joint Munitions Effectiveness Manuals. The DoD Component should provide the data prior to the weapon achieving initial operational capability, and should prepare the data in coordination with the Joint Technical Coordinating Group for Munitions Effectiveness.

9.9.5. Spectrum Management Support

To evaluate spectrum availability, spectrum-related operational restrictions, frequency availability, host nation approvals, electromagnetic compatibility, and other such issues should be considered. An SM OT assessment is essentially a review of the spectrum management process for the system/equipment in question. DT&E and the early phases of OT&E, if appropriate, should determine if spectrum management issues are resolved, prior to Developmental Performance Verification Testing. All systems/equipment that have spectrum requirements normally undergo Developmental Performance Verification Testing. The CAE should review unresolved spectrum management issues when evaluating system

readiness for IOT&E. The DOT&E E3 and SM Assessment Guide for Operational Testing dated 13 June 2001, provides additional information.

9.10. Test and Evaluation Master Plan Recommended Format

The recommended TEMP format for all Acquisition Category I programs, for IT (including NSS), programs regardless of Acquisition Category, and for other OSD T&E Oversight programs begins on the next page. While this format is not mandatory, the following pages reflect staff expectations. The inclusion of all information shown is required for programs under OSD T&E oversight.

TEST AND EVALUATION MASTER PLAN

FOR

PROGRAM TITLE/SYSTEM NAME

Program Elements

Xxxxx

****

SUBMITTED BY

_____ _____

Program Manager DATE

CONCURRENCE

_____ _____

Program Executive Officer DATE

or Developing Agency (if not under the Program Executive Officer structure)

_____ _____

Operational Test Agency DATE

_____ _____

User's Representative DATE

DOD COMPONENT APPROVAL

_____ _____

DoD Component Test and Evaluation Director DATE

_____ _____

DoD Component Acquisition Executive (Acquisition Category I) DATE

Milestone Decision Authority (for less-than-Acquisition Category I)

****

OSD CONCURRENCE

_____

OUSD(AT&L)DS/SE/AS

OSD APPROVAL

_____ _____ _____ _____

Cognizant OIPT Leader / Date

Director, Operational Test and Evaluation

1. PART I-SYSTEM INTRODUCTION

a. Mission Description. Reference the capabilities document and ISP. Briefly summarize the mission need described therein. Describe the mission in terms of objectives and general capabilities. Include a description of the operational and logistical environment envisioned for the system.

b. System Description. Briefly describe the system design, to include the following items:

(1) Key features and subsystems, both hardware and software (such as architecture, interfaces, security levels, reserves) for each increment configuration, allowing the system to perform its required operational mission.

(2) Interfaces with existing or planned systems that are required for mission accomplishment. Address relative maturity and integration and modifications needed for commercial items. Include interoperability with existing and/or planned systems of other DoD Components or Allies. Provide a diagram of the system Operational View (OV-1).

(3) Critical system characteristics or unique support concepts resulting in special test and analysis requirements (e.g., post deployment software support, resistance to chemical, biological, nuclear, and radiological effects; resistance to countermeasures; resistance to reverse engineering/exploitation efforts (Anti-Tamper); development of new threat simulation, simulators, or targets).

c. System Threat Assessment. Reference the System Threat Assessment and briefly summarize the threat environment described therein.

d. Measures of Effectiveness and Suitability. List (see example matrix below) the performance (operational effectiveness and suitability) capabilities identified as required in the approved Joint Capabilities Integration and Development System document. The critical operational effectiveness and suitability parameters and constraints must crosswalk to those used in the Analysis of Alternatives, and include manpower, personnel, training, software, computer resources, transportation (lift), compatibility, interoperability and integration, Information Assurance (IA), Electromagnetic Environmental Effects and Spectrum Supportability, etc. Focus on operational capabilities, not design specifications such as weight, size, etc. Limit the list to critical measures that apply to capabilities essential to mission accomplishment. Include and clearly identify all key performance parameters (KPPs). For each listed parameter, provide the threshold and the objective values from the requirement document and reference paragraph. If the Operational Test Agency (OTA) or the DOT&E determines that the required capabilities and characteristics contained in the capabilities document provide insufficient measures for an adequate OT&E, the OTA or DOT&E shall propose additional measures through the IPPD process. Upon receipt of such a proposal, the capabilities approval authority shall establish the level of required performance.

Measures of Effectiveness and Suitability

Operational Capability	Parameter	Capability Threshold	Capability Objective	Capability Reference
Mobility	Land Speed** Miles	xx miles per hour	xx miles per hour	Paragraph xxx

	per hour on secondary roads			
Firepower	Accuracy Main Gun Probability of hit/stationary platform/ stationary target	xxx probability of hit @ xxx range	xxx probability of hit @ xxx range	Paragraph xxx
Supportability	Reliability Mean Time Between Operational Failure	xxx hours	xxx hours	Paragraph xxx

** Key Performance Parameter

e. Critical Technical Parameters

(1) List in a matrix format (see example below) the critical technical parameters of the system (including software maturity and performance measures) that will be evaluated (or reconfirmed if previously evaluated) during the remaining phases of developmental testing. Critical technical parameters are measurable critical system characteristics that, when achieved, allow the attainment of desired operational performance capabilities. They are not user requirements. Rather, they are technical measures derived from desired user capabilities. Failure to achieve a critical technical parameter should be considered a reliable indicator that the system is behind in the planned development schedule or will likely not achieve an operational requirement. Limit the list of critical technical parameters to those that support critical operational issues. The system specification is usually a good reference for the identification of critical technical parameters.

(2) Next to each technical parameter, list a threshold for each stage of development. Developmental test events are opportunities to measure the performance of the system as it matures. For most technical parameters, the listed thresholds should reflect growth as the system progresses toward achieving the desired capabilities. Also, list the decision supported after each event to highlight technical performance required before entering the next acquisition or operational test phase.

(3) Ensure technical parameters are included for technical interoperability.

Critical Technical Parameters

Supported Operational Capability (Include Initial Capabilities Document /Capability Development Document/ CPD reference)	**Technical Parameter**	**Developmental Stage Event**	**Threshold Value**	**Decision Supported**
In most cases a measure of	Technical measure(s)	Developmental stage events (Described in	Minimum value required at each	May be any decision marking the entrance into

effectiveness or suitability from paragraph 1d.	derived to support operational desired capabilities.	TEMP Part III) designed to measure system performance against technical parameters.	developmental event. Most parameters will show growth as the system progress through testing. Final value should reflect level of performance necessary to satisfy the desired capabilities.	a new acquisition phase or may be a readiness for operational test decision.
Example: Main Gun Probability of Hit, 94 % at 1,500 meters (Capability Development Document. para. xxx.x)	Example: Auxiliary sight Bore sight accuracy	Example: System Demo Test-Accuracy Test Prod Readiness Test-Accuracy Prod Qual Test	Example: +/- 5 mils +/- 3 mils +/- 1 mil	Example: Milestone B MS C (Low-Rate Initial Production Decision) FRP DR

2. PART II-INTEGRATED TEST PROGRAM SUMMARY

a. Integrated Test Program Schedule

(1) Display on a chart (see Figure 1) the integrated time sequencing of the major test and evaluation phases and events, related activities, and planned cumulative funding expenditures by appropriation. Display on a second chart the specific T&E details for the current and next phase.

(2) Include event dates such as major decision points as defined in DoD Instruction 5000.2, e.g., operational assessments, preliminary and critical design reviews, test article availability; software version releases; appropriate phases of developmental test and evaluation; live fire test and evaluation, JITC interoperability testing and certification date to support FRP Decision Review, and operational test and evaluation; low rate initial production deliveries; Initial Operational Capability; Full Operational Capability; and statutorily required reports, such as the Live-Fire T&E Report and Beyond-LRIP Report.

(3) Provide a single schedule for multi- DoD Component or Joint and Capstone TEMPs showing all DoD Component system event dates.

(4) Provide the date (fiscal quarter) when the decision to proceed beyond low-rate initial production is planned. (LRIP quantities required for initial operational test must be identified for approval by the DOT&E prior to entry into System Development and Demonstration Phase for Acquisition Category I programs and other programs designated for DOT&E oversight).

b. Management

(1) Discuss the test and evaluation responsibility of all participating organizations (developers, testers, evaluators, users).

(2) Identify the T&E WIPT structure, to include the sub-T&E WIPTs, such as a Modeling & Simulation or Reliability, with their participating organizations. A more detailed discussion can be contained in a separate T&E charter; however, sufficient detail is needed here for those persons not having convenient access to the charter.

(3) Provide the proposed or approved performance Exit Criteria to be assessed at the next major decision point. For a TEMP update, generated by a program breach or significant change, provide the Acquisition Decision Memorandum-approved Exit Criteria from the current phase's beginning milestone decision, or any revised ones generated by the breach or significant change.

3. PART III-DEVELOPMENTAL TEST AND EVALUATION OUTLINE

a. Developmental Test and Evaluation Overview. Explain how developmental test and evaluation will verify the status of engineering and manufacturing development progress; verify that design risks have been minimized; verify that anti-tamper provisions have been implemented; and substantiate achievement of contract technical performance requirements. Explain how DT&E will be used to certify readiness for dedicated operational test. Specifically, identify:

(1) Any technology/subsystem that has not demonstrated its ability to contribute to system performance and ultimately achieve the desired mission capabilities.

(2) The degree to which system hardware and software design has stabilized so as to reduce manufacturing and production decision uncertainties.

b. Future Developmental Test and Evaluation. Discuss all remaining developmental test and evaluation that is planned, beginning with the date of the current TEMP revision and extending through completion of production. Emphasize the next phase of testing. For each phase, include:

(1) *Configuration Description* . Summarize the functional capabilities of the system's developmental configuration and how they differ from the production model.

(2) *Developmental Test and Evaluation Objectives* . State the test objectives for this phase in terms of the critical technical parameters to be confirmed, to include anti-tamper characteristics. Provide a table of success criteria corresponding to the Critical Technical Parameters to be confirmed, or for each major phase of DT&E, or combination of both. Identify any specific technical parameters that the milestone decision authority has designated as exit criteria and/or directed to be demonstrated in a given phase of testing.

(3) *Developmental Test and Evaluation Events, Scope of Testing, Basic Scenarios, and Integrated Test Opportunities* . Summarize the test events, test scenarios and the test design concept. Quantify the testing (e.g., number of test hours, test events, test firings). List the specific threat systems, surrogates, countermeasures, component, or subsystem testing, and test beds that are critical to determine whether or not developmental test objectives are

achieved. As appropriate, particularly if an agency separate from the test agency will be doing a significant part of the evaluation, describe the methods of evaluation. List all models and simulations to be used to help evaluate the system's performance, explain the rationale for their credible use and provide their source of verification, validation and accreditation (VV&A). Describe how performance in natural environmental conditions representative of the intended area of operations (e.g., temperature, pressure, humidity, fog, precipitation, clouds, electromagnetic environment, blowing dust and sand, icing, wind conditions, steep terrain, wet soil conditions, high sea state, storm surge and tides, etc.) and interoperability with other weapon and support systems, as applicable, to include insensitive munitions, will be tested. Describe the developmental test and evaluation plans and procedures that will support the JITC/DISA interoperability certification recommendation to the Director, Joint Staff (J-6) in time to support the FRP Decision Review. Describe test phases and events that will provide opportunities to integrate testing with contractors and operational testers.

(4) *Limitations* . Discuss the test limitations that may significantly affect the evaluator's ability to draw conclusions, the impact of these limitations, and resolution approaches.

4. PART IV-OPERATIONAL TEST AND EVALUATION OUTLINE

a. Operational Test and Evaluation Overview

(1) The primary purpose of operational test and evaluation is to determine whether systems are operationally effective and suitable for the intended use by representative users in a realistic environment before production or deployment.

(2) Show how program schedule, test management structure, and required resources are related to needed mission capabilities documented in the approved capabilities document, and derived requirements from the ISP; critical operational issues; test objectives; and major decision points. Testing shall evaluate the system (operated by typical users) in an environment as operationally realistic as possible, including threat representative hostile forces and the expected range of natural environmental conditions.

b. Critical Operational Issues

(1) List in this section the critical operational issues. Critical operational issues are the operational effectiveness and operational suitability issues (not parameters, objectives, or thresholds) that must be examined in operational test and evaluation to evaluate/assess the system's capability to perform its mission.

(2) A critical operational issue is typically phrased as a question that must be answered in order to properly evaluate operational effectiveness (e.g., "Will the system detect the threat in a combat environment at adequate range to allow successful engagement?") and operational suitability (e.g., "Will the system be safe to operate in a combat environment?").

(3) Some critical operational issues will have critical technical parameters and thresholds. Individual attainment of these attributes does not guarantee that the critical operational issue will be favorably resolved. The judgment of the operational test agency is used by the DoD Component to determine if the critical operational issue is favorably resolved.

(4) State the measures of effectiveness (MOEs) and measures of performance (MOPs). Define the evaluation criteria and data requirements for each MOE/MOP.

(5) If every critical operational issue is resolved favorably, the system should be operationally effective and operationally suitable when employed in its intended environment by typical users.

c. Future Operational Test and Evaluation. For each remaining phase of operational test and evaluation, separately address the following:

(1) *Configuration Description* . Identify the system to be tested during each phase, and describe any differences between the tested system and the system that will be fielded including, where applicable, software maturity performance and criticality to mission performance, and the extent of integration with other systems with which it must be interoperable or compatible. Characterize the system (e.g., prototype, engineering development model, production representative or production configuration).

(2) *Operational Test and Evaluation Objectives* . State the test objectives including the objectives and thresholds and critical operational issues to be addressed by each phase of operational test and evaluation and the decision points supported. Provide a table of OT&E Entrance Criteria for each phase of OT&E/OA. Operational test and evaluation that supports the beyond low-rate initial production decision shall have test objectives, to include anti-tamper characteristics that interface with operators and maintainers, that resolve all unresolved effectiveness and suitability COIs.

(3) *Operational Test and Evaluation Events, Scope of Testing, Scenarios, and Integrated Test Opportunities* . Summarize the scenarios and identify the events to be conducted, type of resources to be used, the threat simulators and the simulation(s) to be employed, the type of representative personnel who will operate and maintain the system, the status of the logistic support, the operational and maintenance documentation that will be used, the environment under which the system is to be employed and supported during testing, the plans for interoperability and compatibility testing with other United States/Allied weapon, the anti-tamper characteristics to be assessed in an operational environment and support systems as applicable, etc. Identify planned sources of information (e.g., developmental testing, testing of related systems, modeling, simulation, etc.) that may be used by the operational test agency to supplement this phase of operational test and evaluation. Whenever models and simulations are to be used: identify the planned models and simulations; explain how they are proposed to be used; and provide the source and methodology of the verification, validation, and accreditation underlying their credible application for the proposed use. If operational test and evaluation cannot be conducted or completed in this phase of testing and the outcome will be an operational assessment instead of an evaluation, so state and clearly explain the reason(s). Describe the operational test and evaluation plans and procedures that will support the JITC/DISA interoperability certification recommendation to the Director, Joint Staff (J-6) in time to support the FRP Decision Review. Describe test phases and events that will provide opportunities to integrate testing with contractors and developmental testers.

(4) *Limitations* . Discuss the test and evaluation limitations including threat realism, resource availability, limited operational (military, climatic, CBNR, etc.) environments, limited support environment, maturity of tested system, safety, etc., that may impact the resolution of affected critical operational issues. Indicate the impact of the test and evaluation limitations on the ability to resolve critical operational issues and the ability to formulate conclusions regarding operational effectiveness and operational suitability. Indicate the critical operational issues affected in parenthesis after each limitation.

d. Live Fire Test and Evaluation.* Include a description of the overall live fire test and evaluation strategy for the item; critical live fire test and evaluation issues; required levels of system protection and tolerance to terminal effects of threat weapons and lethality; the management of the live fire test and evaluation program; live fire test and evaluation schedule; related prior and future live fire test and evaluation efforts; the evaluation approach and shot selection process; the strategy matrix that identifies planning document approval levels; and major test and evaluation limitations for the conduct of live fire test and evaluation. Discuss, if appropriate, procedures intended for obtaining a waiver from full-up, system-level live fire testing (realistic survivability/lethality testing as defined in 10 U.S.C. 2366) before entry into the System Development and Demonstration Phase at Milestone B, or, in the case of a system or program initiated at Milestone B, as soon as practicable after Milestone B, or if initiated at Milestone C, as soon as practicable after Milestone C. Identify LFT&E resource requirements (including test articles and instrumentation) in the Test and Evaluation Resource Summary.

* Not applicable to AIS programs.

5. PART V-TEST AND EVALUATION RESOURCE SUMMARY

a. Provide a summary (preferably in a table or matrix format) of all key test and evaluation resources, both government and contractor, that will be used during the course of the acquisition program. Specifically, identify the following test resources:

(1) *Test Articles* . Identify the actual number of and timing requirements for all test articles, including key support equipment and technical information required for testing in each phase of DT&E, LFT&E, and OT&E. If key subsystems (components, assemblies, subassemblies or software modules) are to be tested individually, before being tested in the final system configuration, identify each subsystem in the TEMP and the quantity required. Specifically identify when prototype, engineering development, or production models will be used.

(2) *Test Sites and Instrumentation* . Identify the specific test ranges/facilities to be used for each type of testing. Compare the requirements for test ranges/facilities dictated by the scope and content of planned testing with existing and programmed test range/facility capability, and highlight any major shortfalls, such as inability to test under representative natural environmental conditions. Identify instrumentation that must be acquired specifically to conduct the planned test program. Describe how environmental compliance requirements will be met.

(3) *Test Support Equipment* . Identify test support equipment that must be acquired specifically to conduct the test program.

(4) *Threat Representation* . Identify the type, number, availability, and fidelity requirements for all representations of the threat to be used in testing. Compare the requirements for threat representations with available and projected assets and their capabilities. Highlight any major shortfalls. Subject each representation of the threat (target, simulator, model, simulation or virtual simulation) to validation procedures to establish and document a baseline comparison with its associated threat and to determine the extent of the operational and technical performance differences between the two throughout the life cycle of the threat representation.

(5) *Test Targets and Expendables* . Identify the type, number, and availability requirements for all targets, weapons, flares, chaff, sonobuoys, smoke generators, acoustic

countermeasures, etc., that will be required for each phase of testing. Identify any major shortfalls. Subject each threat target to validation procedures, tailored to characteristics of interest, in order to establish and document a baseline comparison with its associated threat and to ascertain the extent of operational and technical performance differences throughout the threat target's life cycle.

(6) *Operational Force Test Support* . For each test and evaluation phase, identify the type and timing of aircraft flying hours, ship steaming days, and on-orbit satellite contacts/coverage, and other critical operating force support required.

(7) *Simulations, Models and Testbeds* . For each test and evaluation phase, identify the models and simulations to be used, including computer-driven simulation models and hardware/software-in-the-loop test beds. However, provide the discussion of how these models and simulations will be used in Parts III and IV. Identify the resources required to accredit their usage. Identify the M&S Proponent, the V&V Agent, and the Accreditation Agent for intended user.

(8) *Special Requirements* . Discuss requirements for any significant non-instrumentation capabilities and resources such as: special data processing/data bases, unique mapping/charting/geodesy products, extreme physical environmental conditions or restricted/special use air/sea/landscapes.

(9) *Test and Evaluation Funding Requirements* . Estimate, by Fiscal Year and appropriation line number (program element), the funding required to pay direct costs of planned testing. State, by fiscal year, the funding currently appearing in those lines (program elements).

(10) *Manpower/Personnel Training* . Identify manpower/personnel and training requirements and limitations that affect test and evaluation execution.

b. Project the time-phased test and test support resources necessary to accomplish development, integration and demonstration testing and early operational assessment. Estimate, to the degree known, the key resources necessary to accomplish developmental test and evaluation, operational assessment, live fire test and evaluation, and operational test and evaluation. These include test and training ranges of the Major Range and Test Facility Base (MRTFB), test equipment and facilities of the MRTFB, capabilities designated by industry and academia, unique instrumentation, threat simulators, targets, and modeling and simulation. As system acquisition progresses, the preliminary test resource requirements should be reassessed and refined, and subsequent TEMP updates should reflect any changed system concepts, resource requirements, or updated threat assessment.

6. Annex A-BIBLIOGRAPHY

a. Cite in this section all documents referred to in the TEMP.

b. Cite all reports documenting technical, live fire, and operational testing and evaluation.

7. Annex B-ACRONYMS

List and define acronyms used in the TEMP.

8. Annex C-POINTS OF CONTACT

Provide a list of points of contact as illustrated by Figure 2.

9. ATTACHMENTS

Provide as appropriate.

FIGURE 9.10.1. - Integrated Test Program Schedule

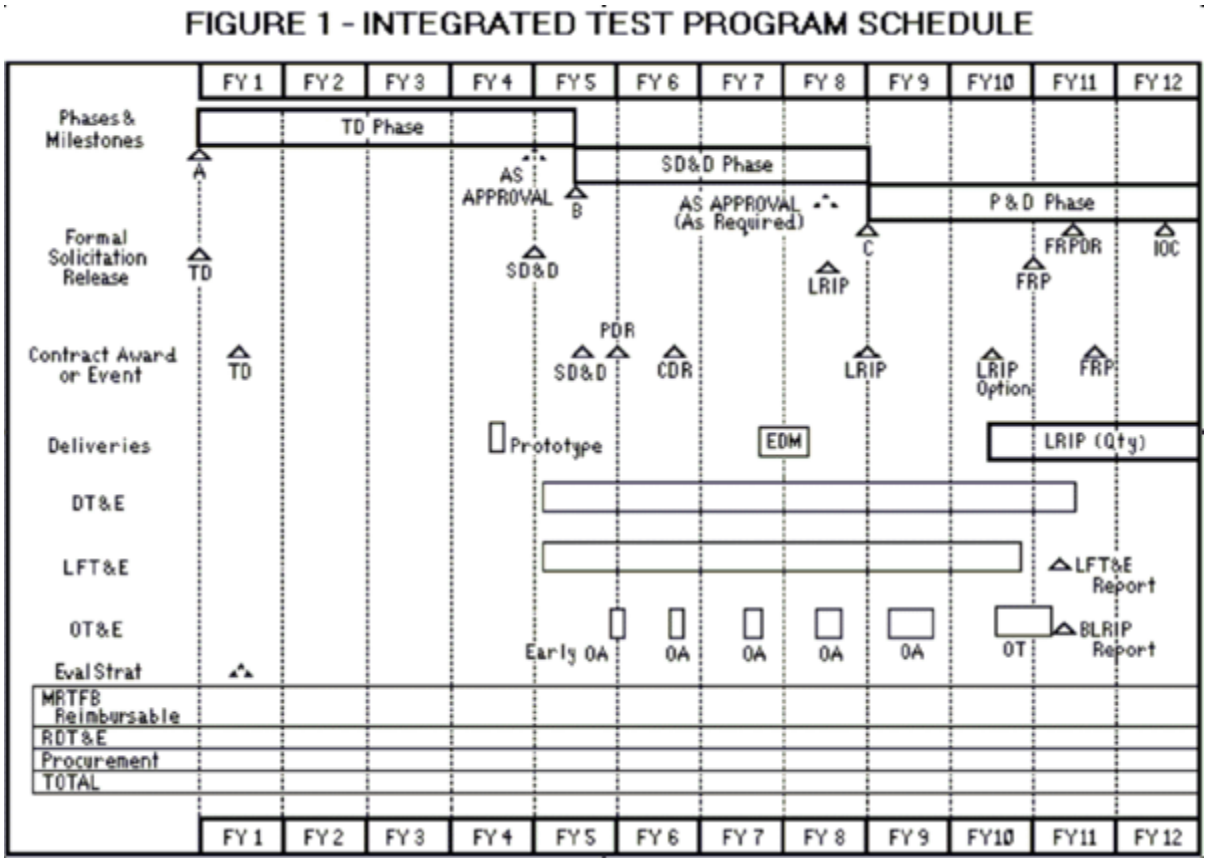

FIGURE 2 - PROGRAM POINTS OF CONTACT

NAME ORGANIZATION TELEPHONE (COMM/DSN) E-MAIL ADDRESS

DoD Component Secretary/Agency Director/Monitor/Coordinator

User Representative

Program Manager

Developmental Test Director/Coordinator

Operational Test Director/Coordinator

DoD Component T&E Action Officer

OUSD(AT&L)/DT Action Officer

OSD/DOT&E Action Officer